THE

FRANKLIN JOURNAL,

AND

AMERICAN MECHANICS' MAGAZINE;

DEVOTED TO THE USEFUL ARTS,

Internal Improvements, and General Science.

JUNE, 1828.

ENGLISH PATENTS.

Russell's Hydro-Pneumatic Liquor Cock.

Fig. 1.

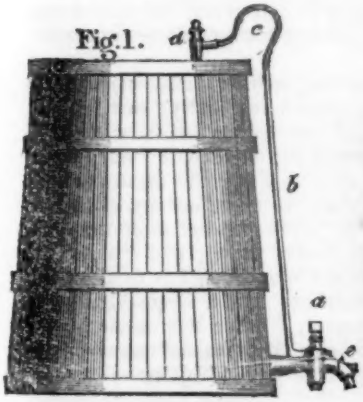
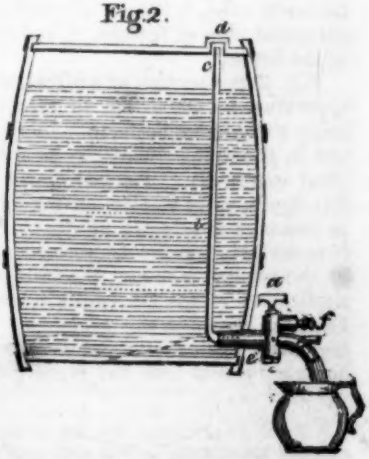


Fig. 2.



Description of Mr. W. Russell's *Patent Hydro-Pneumatic Liquor Cock, with Air-Vent attached.*

It is well known that the admission or escape of air by the smallest aperture in vessels containing wine, beer, and other liquors, will soon destroy all their good qualities; at first they are rendered vapid or flat by the escape of the alcohol and the carbonic acid gas, upon which depend their strength, briskness, and flavour: and after-

wards, they become sour by the absorption of the oxygen of the atmosphere, which is admitted. The defective manner in which such vessels have been usually stopped makes it highly desirable that something should be invented, the application of which would put it *out of the power* of any person, however negligent, to produce those injurious effects upon the liquor; and we are pleased to find, that this has been fully attained by Mr. Russell's Hydro-pneumatic Cock. By its means all casks or vats containing fermented or other liquors may be kept perfectly air-tight; but possessing at the same time the power of admitting such portion of air only, upon drawing off the liquor, as may be necessary to allow it to run out. The distinct operations of drawing off the liquor, and giving vent, are performed at the same instant of time, and by the same movement as in other cocks, viz. by merely giving the handle a turn, one quarter round; and upon turning the handle in the contrary direction, both the air and the liquor passages are effectually and simultaneously closed.

Fig. 1, is a view of a vat with the Hydro-pneumatic Cock and air tube, applied externally. The cock, *a*, is in this instance, to a certain extent, of the ordinary construction, but instead of having only one aperture for the liquor to pass, it has another just above it, of smaller dimensions, for the transmission of the air: upon turning the cock to draw off, the air enters into this smaller aperture above the liquor passage, then passes along its channel through the cock, into the metal tube, *b*, thence proceeding up to *c*, it enters the vat through the metal plug or ferrule, *d*, and is there discharged *above the surface of the liquor.**

Fig. 2, is a section of a barrel, showing another modification of the apparatus, by which the air tube is placed internally; this method being considered preferable in large brewers' or distillers' vessels, and in situations where the tube would be exposed to injury if applied externally. Letters *a*, *b*, *c*, *d*, *e*, apply to the same parts in this figure, as in Fig. 1; but the aperture for the admission of the air in this cock is situated at the side (at *e*:) the operation of the cock is nevertheless the same with regard to the principle of the patent. In the present instance, the air aperture is so placed as to allow the application of Mr. Russell's improvement to Mr. Bramah's Patent Lock, as shown in the projecting barrel, *f*. For this latter highly ingenious application and improvement, Mr. Russell received an honorary medal from the Society of Arts. [*Register of Arts.*

* It will be perceived that the article herein described is very different in its external appearance, as well as its application, to that subsequently sold in the shops as a substitute for the hydro-pneumatic, under the name of the syphon-cock. In Mr. Russell's, the air is conveyed by means of a long tube to the top of the vessel, or above the surface of the liquid, which keeps it undisturbed, and perfectly clear: but in the substitute above-mentioned the long tube is cut off close to the cock, so that the air is admitted at the bottom of the vessel directly into the body of the liquor; and by its forcible entrance, and bubbling upwards, it must necessarily disturb the light flocculent matter which generally floats at the lower parts of such vessels, and being thus frequently agitated, the whole contents must become more or less turbid. [*Editor of Reg.*

Remarks by the Editor.—It is now about twenty-five years, since Professor Hare invented a cock, similar in its mode of action to that above described. This is figured and described in the Transactions of the American Philosophical Society: it is constructed exactly like the common cock, but has a second channel, of a small size, above the ordinary vent, and passing like it, through the key, and into the vessel; through this small channel the air enters, whilst the liquor escapes at the larger.

It appears that a cock, in all respects similar to that invented by Dr. Hare, is now sold in London, under the name of the syphon-cock. The advantage claimed for the patent apparatus, is, that as the air does not bubble up through the liquid, there is no danger of disturbing it; its greater complexity, however, will prevent its general adoption: and this is a prophecy which may safely be made of all complex means of attaining simple ends, in the operations of every day.

Account of the Patent granted to WILLIAM CHOICE *and* ROBERT GIBSON, *for their Invention of certain Improvements in Machinery for Making Bricks.*

THE drawing, which accompanies this specification, is an attempted representation of the machine in perspective, but so extremely rude and inaccurate, that we can only give a general idea of the intentions of the patentees, not being able to comprehend precisely how they propose to put those intentions into such a mechanical form as may be capable of acting.

The machine consists, in the first place, of an upright shaft, which is made to revolve by an arm with a yoke, to be attached to a horse as in ordinary horse mills. To the upper part of this central shaft, a large horizontal toothed wheel is affixed, which takes into another horizontal toothed wheel on the top of the perpendicular shaft of a pug-mill. Thus the traversing of the horse in its circular track, turns the central shaft, and all that is appended to it, and also drives the shaft of the pug-mill.

The pug-mill, as usual, is a large cylindrical tub set upon its end, containing the clay and other materials of which the bricks are to be made, and the perpendicular shaft turning within it, carries a series of knives, which, as they revolve, cut up and mix the clay and other materials together, and discharge it, after being so mixed and prepared, through an aperture near the bottom of the tub, on to a circular plate.

The bricks are to be formed in hollow moulds or boxes, about thirteen inches long, nine inches wide, and two and a half deep, with partitions dividing them into three, by which means three bricks will be made at a time. These boxes have three plungers within each, for the purpose of pushing the bricks out of the moulds when made.

At the lower part of the upright main shaft, three levers are

attached in radial positions, by joints, which allow them to rise and fall perpendicularly. These radial levers are placed at equal distances apart, and at their outer extremities carry the mould boxes. About the middle of each lever, at its under side, a roller is attached, upon which rollers, the levers carrying the moulds run round as the upright shaft turns; and in their course the moulds receive the clay, and afterwards deposit it in the form of bricks, on to an endless band, which conducts them away to be dried and burnt.

It being now understood that the mould boxes traverse round, for the purpose of receiving the clay, and then discharging the brick, it remains to be explained by what means the boxes are made to rise and fall, and effect these objects.

On the floor of the machine, round which the levers and mould boxes traverse, three inclined planes are fixed, and over these, the rollers on the under side of the levers pass as they proceed round. Let it be supposed that one of the rollers is now ascending one of the inclined planes, the lever will be raised on its fulcrum joint, and the mould box lifted up; when the roller has reached the extremity of the inclined plane, the lever instantly falls down, and causes the mould box to strike on to a bed of soft clay, discharged from the pug-mill, and spread upon a circular flat plate beneath.

The mould having been thus filled with clay, it is slidden off, on to the surface of another flat plate, which, being wetted, smoothens the under part of the bricks as they slide over it. From the last mentioned plate, the mould box slides on to an endless band, upon which small boards are previously placed to receive the bricks, and a heavy block or rammer falling at this time on the upper surface of the mould box, (by the action of a lever depressed by a cam on the under side of the large horizontal toothed wheel as it revolves,) the projecting heads of the plungers are driven into the box, and the bricks forced out of the moulds on to the endless band, which, as before said, conducts them away to be dried and burnt.

The roller under the lever, now rises up the second inclined plane, lifting the empty mould box, and when it arrives at the edge of the inclined plane, down falls the lever, and plunges the mould box into a vessel of water, placed beneath for the purpose of wetting the mould.

The third inclined plane effects the same action, and causes the mould to fall into a vessel of dry sand, which sand, adhering to the wetted surface of the mould, prepares it to receive the clay for another set of bricks, in the manner already explained.

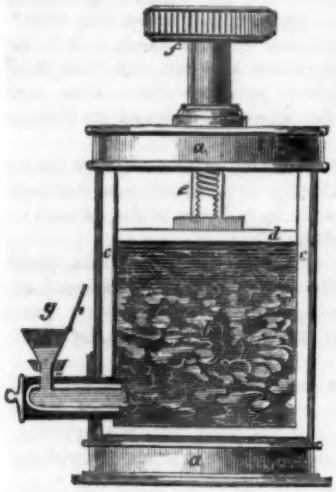
There being three mould boxes affixed to the three levers as above stated, their actions are simultaneous, and similar, every rotation of the horse with the central shaft producing nine bricks.

These are the intended operations of the machine, the leading features of novelty in which, are the levers that rise and fall with the moulds, in the way, and for the purposes above stated. There are several of the minor details of the machine, which we cannot comprehend from the specification, but we presume that its general construction will be sufficiently evident from the above.—[Enrolled June, 1826.] [*Newton's Journal.*

Edwards's *Patent Ink-stand.*

This is an excellent ink-stand, on account of its superior convenience, and stability; and, from its extreme simplicity, it is not liable to get out of order.

The construction will be readily understood by reference to the annexed figure, which gives a side view, or elevation, of the invention; those parts between the top and bottom *a a* are, however, shown in section, that its internal construction, and mode of action, may be made apparent. The external casing is of metal, bronzed, and elegantly wrought. The internal is a cylindrical glass cup *c c*, of considerable thickness, the upper part of which is closed by a glass piston *d* accurately fitting the cylinder, so as to allow of its being easily moved up and down. In this casing of glass is placed a quantity of loose horse-hair and wool, which imbibes and retains the ink, free from contact with the metal, that would otherwise become corroded. On the upper surface of the glass piston a hollow screw *e*, with a disk of metal at the end, is made to operate by pressure downwards; when the top piece *f* is turned by the finger and thumb, the latter turns the solid screw, and causes the hollow screw to advance or recede with a sliding motion, so as to press uniformly upon the piston without the friction of turning against its surface.



At the lower part of the ink reservoir an aperture is made, into which a tube is fixed, that conducts the ink to the little cup *g*, when the wool is compressed by a turn of the screw pressing down the piston. The little cup previously empty is thus instantly supplied with fresh ink with no more trouble than taking up a pen, and should a little more ink be forced into the cup than is necessary, by carelessly turning the screw too far, it runs over, and is caught in the little saucer shown below. When the inkstand is not in requisition, a half turn of the screw, the reverse way, causes the ink to flow back again; as the wool being thereby relieved of the pressure, re-absorbs the fluid.

The ink being thus returned into the reservoir, none can be spilled, even if upset; it is preserved from the contact of the air, consequently, from drying up, as well as from dust; and it may be instantaneously brought into use whenever required. These are advantages which will be appreciated by every body, but more especially by persons travelling, or in the army and navy.

Patent granted to PETER GROVES, Esq. *for his invention of certain improvements in manufacturing White Lead.*

THE improvements proposed under this patent, are a new mode of producing a material called ceruse, or white lead, for the use of painters. It is proposed to take a quantity of sulphuret of lead, or lead ore, say half a ton, and having divided it into a powder, by pounding or rolling, then burn or roast it at a temperature below that which would melt the metal. After the ore has become cold, it is to be pulverized again, and reduced to the finest powder, and then well washed in water, taking off the lighter particles which float, and pounding the coarser again, until the whole is reduced as fine as possible.

This powder is now to be dried in pans, by exposure to the air, or in a suitable stove; and when perfectly dry, about two hundred weight of saltpetre is to be mixed with it, and the whole placed in a retort to undergo a sort of distillation.

The retort to be employed is a cylindrical vessel of iron, lined with lead, placed erect, within another as a jacket, and fastened together by flanches, forming a steam-tight joint, and leaving a space between all round and at bottom, for the passage of steam, by which the retort is to be heated.

In this vessel, the materials above prepared, are to be placed, and to be constantly agitated during the operation, by means of a perpendicular shaft with arms, which is introduced into the cylinder, and may be turned round by hand, or by any other convenient means.

Above the cylinder there is a vat, or cistern, intended to contain about two hundred weight of sulphuric acid, of a specific gravity of from 1·400 to 1·740. From this vat two pipes descend, one leading to the top of the cylinder, which admits the acid through a stop-cock, the other to the bottom; through the latter of which, by means of a force pump, the acid is gradually injected into the cylinder at the lower part.

Steam from a boiler, under considerable pressure, is now admitted into the chamber surrounding the containing cylinder, for the purpose of heating the materials within. This operation is to be continued for several hours, the stirrer being continually turned, for the purpose of bringing all the particles of the material under the action of the acid and the heated vapour.

The top of the cylindrical vessel is of course to be closed, having an aperture with stuffing, through which the upper end of the spindle or shaft of the stirrer passes, but a tube is introduced into the top for the purpose of carrying off the vapour arising within the vessel, to a condenser, or into a chimney, or away into the open air, at a distance from the workmen. A hole is likewise made in the top with a stopper, by which small quantities of the material can be occasionally withdrawn, by a ladle, for the purpose of ascertaining the progress of the operation within.

The pulverized ore having been thus operated upon for several hours, it is afterwards allowed to remain in the retort for two or three days, or under some circumstances for a longer time, occasionally stirring it up, and drawing off the acid. It is then removed and washed in water in order to discharge the acid; and when this is done and the material dried, a similar quantity of saltpetre is again mixed with it in the retort, and the operation performed in a fresh quantity of acid as before.

The material being a second time withdrawn from the retort, it is to be thoroughly washed in warm water, until every appearance of acid has become completely removed; after which, being dried, and then ground in water, in the way white lead is usually treated, the material becomes fit for use.

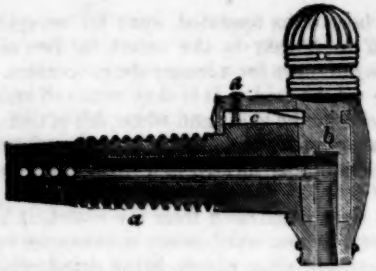
The patentee has proposed to employ sulphuric acid in the retort, but in the second operation he sometimes uses nitric acid, and under certain circumstances, other acids. He has described a particular formed vessel to be used as a retort, but has not exhibited any figure, as the vessel may be variously constructed, without deviating from the general principle. Steam, under great pressure, is proposed, and most approved as the heating material, but fire may be applied directly to the under part of the vessel, and effect the same object.

Thus a variety of changes may be made in the modes of conducting the operation, all of which come within the contemplation of the patentee, and are claimed by him under the present patent.—[Enrolled January, 1827.] [*Newton's Journal.*

RIDGEWAY'S *Patent Porcelain Cocks or Taps.*

To construct a cock or tap for the drawing off liquids, of a material not subject to corrosion, and capable of bearing the blows to which they are liable, has been long a desideratum in this instrument. Messrs. J. and W. Ridgeway, of the Staffordshire Potteries, have invented and taken out a patent for an elegant and substantial apparatus of the kind; it is made of the strongest porcelain, or stoneware. The earths employed to produce the composition being similar to those in general use for the manufacture of porcelain. The materials being ground, mixed, and made into a paste, the several pieces of which it is made are moulded and cut to the required shapes; the circular parts are turned in a lathe, and those of a tubular form bored and turned by similar means. The parts are joined together by moistening the junctures, and afterwards baked.

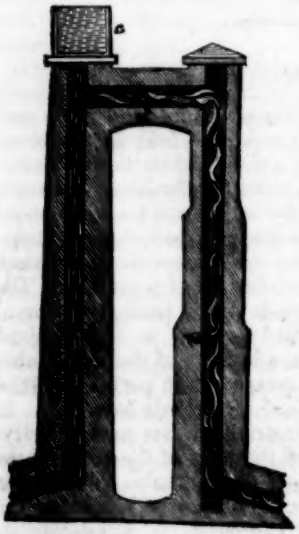
The form, as well as the interior construction, has some novelty; the annexed diagram gives a section of the body of the cock, of the form most approved by the patentees: *a* is the long tube, with a screw thread cut upon its external surface for the purpose of being screwed into the barrel; *b*, the plug, accurately ground and fitted into its place, in which a vertical perforation is made, by boring, so as to form a channel for the liquor, of equal diameter to that in the long



tube *a;* the plug is then bored horizontally, so as to open a communication with the vertical perforation, and also with the long tube when the plug is turned in the direction shown for drawing off the liquor. To secure the plug in its place, and produce a uniform action, it has a groove made three quarters round it, for receiving the end of the bolt *c*, which is fastened by the screw *d*.

The patentees have likewise described in their specification a "lock-cock," of which we give no figure, as it will be seen, by the construction of the above, that such an application is easily made. Under the bolt which keeps the plug down in its place, is fitted another bolt with a spring (like those in common cabinet locks,) and under this bolt a hole is made for the insertion of the key, which projects the bolt into a mortice hole in the plug; this hole being only open to the bolt when the liquor is turned off, the latter may thus be secured from depredation.*

MR. JEFFERY's *Patent Method of Condensing Smoke, Metallic Vapours, &c.*



THE highly pernicious and even deleterious effects produced upon the inhabitants, the cattle, and the vegetation, by the smelting of ores, in the vicinity of extensive works of the kind, led Mr. Humphrey Jeffery, of Bristol, to devise the following plan of a flue as a remedy for the evil; for which a patent was enrolled by him several months ago.

The annexed figure gives a vertical section of the patent flue. *a* represents a common flue proceeding from any description of furnace; the top of which being closed, the vapour proceeds along the horizontal branch *d*, into the condensing shaft *b;* on the top of this second shaft is placed a cistern of water, the bottom of which is perforated with numerous small holes; and being duly supplied with

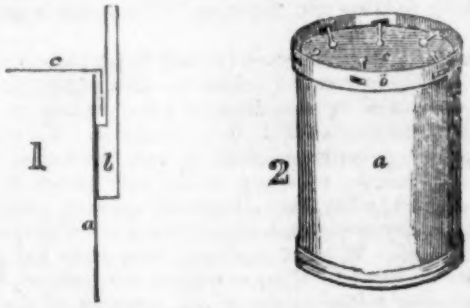
* A number of these cocks have been imported into the U. S., and are approved by those persons who have had them in use. EDITOR.

water, a constant shower like fine rain is produced whilst the furnace is at work. The showering of the water causes a strong draft, by which the vapour is drawn into the current, and immediately condensed. The several matters thus condensed, run off along with the water through the passage *e*, into recipients suited to the nature of the products obtained by the operation. When only one common wall divides the smoke passage from the condensing shaft, a hole through the wall, of the same area as the chimney, will answer equally well.

This invention is unquestionably most excellent and effectual, and the advantages attending it must be very great, where a sufficient supply of water can be obtained.

DICKENSON'S *Patent Metal Casks.*

THIS is a recently patented invention by Mr. Robert Dickenson, of the Eagle Foundry, Southwark. The object of it is the preservation of provisions and other materials used on ship-board, or for exportation; but chiefly for the use of the British Navy. The improvements relate to two distinct points; first, the mode of constructing the cask itself, and second, in a method of applying a coating, both outside and inside of the vessel, that shall be alike impervious to air and water.



These casks are made of wrought iron, of a cylindrical form, with a seam, soldered or rivetted in the usual way. To strengthen the figure and adapt it for the reception of the heads, a strong iron hoop is rivetted to each end of the cylinder. These hoops are prepared at the iron works by rolling them into the form of a rebate, shown in section at *b*, *fig.* 1. By this diagram it is also shown that the hoop is fastened with the thickest part against the side of the cask *a*, about an inch below the extreme edge of the same; thus forming a deep groove between the sides of the cask and the thinnest part of the rebated hoop, for the reception of the flanch of the head *c*, which appears to be made by bending the periphery of the circular iron plate to a right angle with its plane. Previous to the driving down of this head, a sort of packing, composed of hemp bands, or curriers'

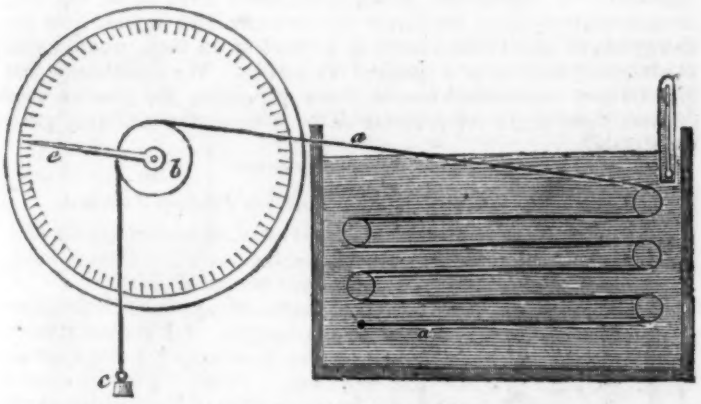
leather shavings, is to be rammed into the groove, so as effectually to exclude both air and moisture. To secure the bottom head in its place, the thin projecting edge of the hoop is to be hammered down upon the bottom; and over this is to be rivetted a flat iron ring to serve the purpose of the ordinary chimes of casks, the exterior edge of which should extend a little beyond the periphery of the cylinder to defend the sides of the cask, in rolling it.

The upper head of the cask is so constructed as to be removeable at pleasure, the hoop which circumscribes it being the same as that on the bottom; but instead of being hammered down, it is left erect, as shown in *fig.* 2. The head is placed also within a similar groove, and is fastened down by means of a number of latch bolts. These latch bolts are attached to the head or moveable cover by means of a pivot at one end, upon which they turn, and are driven sideways into long slots made through the projecting hoop; which slots are not made in a parallel line with the top of the cask, but aslant, so that when the latch bolts are driven into them by a hammer, they draw the flanched head into the deep groove, which being previously packed in the manner before mentioned, makes the junction perfectly air and water tight. This kind of cover likewise admits of its being very readily removed, by driving back the latch bolts with a hammer; and the inconvenience formerly experienced from the smallness of the apertures in air tight vessels, is herein completely removed, the opening being as wide as the cask itself; so that larger matters may be stowed in them, and the packing and removing of the contents greatly facilitated.

Metal casks heretofore employed for similar purposes were usually coated with paint, to prevent oxidation, and render them water tight, which was found to communicate a bad flavour to the flour, biscuit, or other materials which they contained. To remedy this inconvenience, the patentee proposes to coat the casks or barrels both inside and outside, with any of the well known water-proof compositions, which, while they effectually prevent oxidation, will not communicate any unpleasant taint to the articles of food, even in the hottest climates. Without confining himself to any particular formula for the preparation of the coating or composition, which will be varied according to the nature of the contents of the cask, (to prevent those chemical changes which peculiar affinities would render them liable to) the patentee has selected the following, which may, in general, be used. To one pound of caoutchouc (Indian rubber) add 8 oz. of black rosin, and 2 oz. of Venice turpentine; let the caoutchouc be cut into small pieces, and expose the mixture to a heat of 160° for the space of 24 or 36 hours. When dissolved, it is to be spread upon canvass or other fibrous material, and then passed between cylindrical rollers to give it an even consistency. With this material the casks are to be coated both within and without, except in the case of dry goods, such as biscuits, flour, &c. when the coating of the exterior alone is considered sufficient; the interior surface of the iron may be bronzed in the same manner as gun barrels. For oils, tar, varnish, &c. the insides of the barrels have no

coating, those materials being of themselves preservatives against oxidation. In some cases of dry goods, the inside may be coated with the thinnest and cheapest woven material, or even with paper, and these may be attached by any cheap kind of cement, by common glue, or paste; the object being to exclude the air and moisture in the cheapest, simplest, and most convenient manner. The patentee being the inventor and manufacturer of the wrought-iron buoys now so much in use, and other machines of the kind, it need hardly be added that he has succeeded in constructing these vessels in the completest and most effectual manner.

Description of GURNEY'S *Pyrometer. By* L. HERBERT, *Editor of the Journal of Arts.*



THE above engraving is a representation of Mr. Gurney's improved Pyrometer, which we saw some time since in that gentleman's lecture room, when he gave us permission to publish a description of it.

For ascertaining the relative expansibility of the various metals which can be drawn into wire, this invention is, unquestionably, the most sensible and accurate, of any hitherto constructed. And as the employment of pyrometers in this way constitutes their chief use, Mr. Gurney's will, probably, be very generally adopted; more especially on account of its great simplicity and little cost.

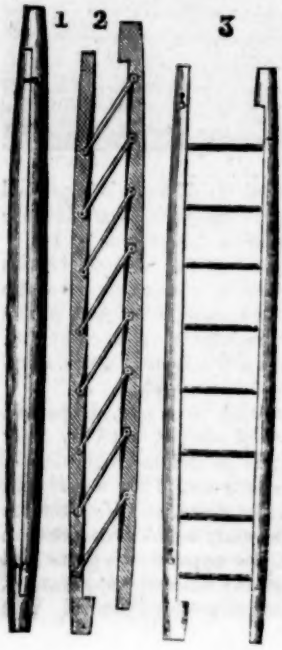
The wire *a* being attached at the lower end to a peg, is passed successively round four or five little pulley wheels, fixed by their axles upon a piece of board, and arranged in the manner shown. From the uppermost pulley, the wire proceeds out of the vessel and passes over a small central wheel *b* of the dial plate, and from thence descending, a weight *c* is appended to that end; which preserves the wire in a state of tension. Thus prepared, the apparatus is immersed in a vessel of water or other fluid heated to any desired temperature, which is ascertained by a thermometer being suspended therein. The

expansion that then takes place by the increase of heat, is accurately denoted by the index *b*, and the graduated scale of the dial; the index being fixed to the central wheel, moves round as the wire elongates. Upon abstracting the heat, the wire contracts, and draws back the wheel and index to its original position.

By this very excellent contrivance it is evident that a table of the expansibility of the metals, at given temperatures, may be formed with the utmost precision, which would furnish information of a most desirable nature in many branches of the arts, but particularly in the construction of time-pieces.

The sketch for the preceding engraving was made from memory, and it now appears to us that the central wheel of the dial on which the index is fixed, is drawn rather too large in proportion; for it must be obvious that the smaller the dimensions of this wheel, and the larger those of the dial, the more sensible and delicate will be the indications of expansion. If the little wheel were to be one inch in circumference, and the circle of the scale 100 inches, then the elongation of wire to the extent of a tenth of an inch, would cause the index to move over a space of ten inches. We understand that Mr. Gurney constructed one on these principles, that showed even the variations in the temperature of the atmosphere, with very great exactness.

Description of GREEN'S *New Portable Folding Ladders.*



A MR. GREEN, of London, has invented a folding ladder, which is remarkably compact and portable.

This convenient apparatus is delineated in the margin. Its construction is so apparent as to need but few observations. Fig. 3 shows the ladder opened out for use;—Fig. 2 the ladder partly closed, and shown in section, that the nature and adaptation of the jointed steps may be rendered obvious;—Fig. 1 shows the ladder folded up close, forming, exteriorly, a round pole tapered at each end, with all the steps enclosed within it.

Mr. Green has lately constructed a ladder for the purpose of rescuing persons who may have the misfortune to sink under ice; it is said to be admirably adapted to the purpose, and that it affords great security to the person employed as the deliverer; the invention has in consequence, we learn, been approved and rewarded by the Society of Arts.

Mr. Donovan's *Apparatus for filtering, in Closed Vessels.*

The object of this very convenient apparatus, is the filtering of fluids out of contact with the atmosphere; alkaline solutions may thus be preserved in their caustic state, by preventing the absorption of carbonic acid by the alkali.

In the preparation of pure potash, when the carbonate of potash, the hydrate of lime, and the water, have been exposed for a while to each other's action, the mass becomes so absorbent, and of such a consistence, as to pass the filter very slowly, and with great difficulty. Experiencing inconveniences of this nature, Mr. Donovan contrived the annexed apparatus, by which the process of filtration may be conducted with the total exclusion of the atmosphere.

a is a bottle of *green** glass with a funnel shaped end inserted into another bottle *b*, the junction being luted or ground to fit closely; the neck *d* of the upper vessel has a cork tightly fitted to it, perforated in the middle for the reception of the glass tube *c*, which being bent downwards, enters the branched neck *e* of the lower vessel, thus connecting them together, and opening an air passage between them. The funnel-shaped end of the upper vessel has a piece of linen, loosely rolled up, placed in it for the purpose of filtering; but in filtering the corrosive acids, a stratum of pounded flints should be employed instead of the cloth.

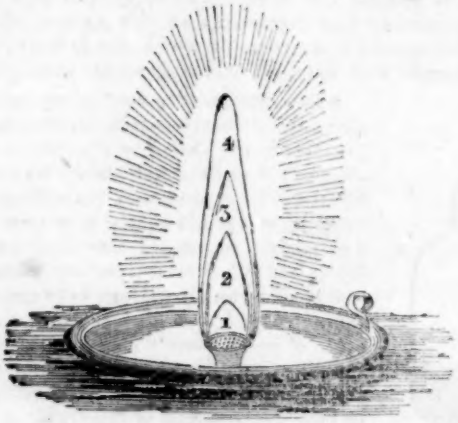
To charge the upper vessel with the alkaline solution, the tube *c* must of course be removed, and the first droppings should be allowed to run to waste previously to the apparatus being fitted together, that no absorption of carbonic acid may take place in the filtered liquor. When the whole is properly closed, the filtration will proceed without the possibility of any absorption taking place.

Now it is evident that no liquor can fall from the upper vessel, without an equal volume of air entering it, and that none can enter the lower, without an equal bulk of air escaping from it. Both of these conditions, it is obvious, are fulfilled by the connecting tube *c*, the air being expelled from the lower to the upper vessel, at every dropping of the filtered liquid. The whole process is therefore conducted without access of more air than the vessels first contained, and in the most cleanly and perfect manner.

* Mr. Donovan recommends *green* glass in preference to white, being less liable to crack by the action of fixed alkalies.

The utility of this excellent contrivance is very extensive. The most volatile liquids, such as ether, alcohol, ammoniacal liquors, essential oils, &c. may be filtered without loss, as the vapours cannot escape during the operation; and by the exclusion of the atmosphere in the filtration of a variety of fluids, other injurious effects, to which they are subject, by the common process, may be entirely obviated.

The Graduated Nautilus Lamp, or New Floating Light.



The improvement which distinguishes this elegant little instrument from the ordinary self-generating oil gas float, being the means of causing the principle to be applied in a manner more extensively useful and convenient, will, it is trusted, gain it the approbation and patronage of all who have occasion for a night, or chamber light. The advantage peculiarly belonging to it, consists in its capability of yielding four distinct degrees of flame, so that it may be accommodated to the occasion; a larger or smaller one being used, according as convenient or necessary.

Directions.—Let the instrument float on the surface of the oil; then, by means of the little tongs, place carefully in the recess at the bottom, either of the two rings; apply a light to the top of the glass tube, and a medium flame will be produced, which, by taking out the ring, will be reduced to the first or lowest degree: this may at any time be raised to the second, third, or fourth degree, as suitable to the occasion:—to the second, by means of the small ring; to the third, by the larger ring; and to the fourth, by two rings.* For general service, the second and third degrees will be found most useful; the first, when a small, long continued, and economical light is required.

* These little rings operate merely as weights, which, by depressing the tube, occasion a greater supply of oil, and consequently a larger flame.—Ed.

On Chloride of Lime, or Bleaching Powder. By Andrew Ure, M. D., F. R. S., &c.

[Concluded from p. 324.]

Science has done only half her duty, when she describes the best apparatus and manipulations of a process. The *maximum* product should be also demonstrated, in order to show the manufacturer the perfection which he should strive to reach, with the *minimum* expense of time, labour, and materials. For this end I instituted the following researches:—I first examined fresh commercial specimens of bleaching powder; 100 grains of these afforded from 20 to 28 grains of chlorine. This is the widest range of result, and it is undoubtedly considerable; the first being to the second, as 100 to 71. The first yielded, by saturation with muriatic acid, 82 grains of chloride of calcium, equivalent to about 41 of lime; it contained besides 26 per cent. of water, and a very little common muriate ready formed. On heating such powder in a glass apparatus, it yielded at first a little chlorine, and then oxygen, tolerably pure. The bulk of chlorine did not exceed one-tenth of the whole gaseous product. Of the recently prepared powder of another manufacturer, 100 grains were found to give, by solution in acid, 23 grains of chlorine, and there remained, after evaporation and gentle ignition, 92 grains of muriate of lime, equivalent to about 46 of lime. Supposing this powder to have been nearly free from muriate, (and the manufacturers are anxious to prevent the deliquescent tendency which this introduces,) we should have its composition as follows:—

Chlorine,	23		3.5
Lime,	46	one atom 3.5 × 2 =	7.0
Water,	31		
	100		

This powder being well triturated with different quantities of water at 60°, yielded filtered solutions of the following densities at the same temperature:

	Sp. gr.
95 water + 5 bleaching powder,	1.0245
90 + 10	1.0470
80 + 20	1.0840

The powder left on the filter, even of the second experiment, contained a notable quantity of chlorine, so that the chloride is but sparingly soluble in water; nor could I ever observe that partition occasioned by water in the elements of the powder, of which Mr. Dalton and M. Welter speak. Of the solution 80 + 20, 500 grains, apparently corresponding to 100 grains of powder, gave off, by saturation with muriatic acid, 19 grains of chlorine, and the liquid, after evaporation and ignition, afforded 41.8 grains of chloride of calcium, equivalent to 21 of lime. Here 4 per cent. of chlorine seem to have remained in the undissolved calcareous powder, which indeed, on

examination, yielded about that quantity. But the dissolved chloride of lime consisted of 19 chlorine to 21 lime; or of 4.5 atoms of the former, to almost exactly 5 (which is no atomic proportion) of the latter. The two-thirds of a grain of lime existing in lime water, in the 500 grains of solution, will make no essential alteration in the statement. Now the above bleaching powder must have contained very little muriate of lime, for it was not deliquescent. Being thus convinced, both by examining the pure chloride of my own preparation, as well as that of commerce, that no atomic relations are to be observed in its constitution, for reasons already assigned, I ceased to prosecute any more researches in that direction.

When we are desirous of learning, minutely, the proportion between the chloride and muriate of lime in bleaching powder, pure vinegar may be used as the saturating acid. Having thus expelled the chlorine, we evaporate to dryness, and ignite, when the acetate of lime will become carbonate, which will be separated from the original muriate by solution and filtration.

I have found, on trial, the method by carbonic acid to be exceedingly slow and unsatisfactory. After passing a current of this gas for a whole day through the chloride diffused in tepid water, I found the liquid still to possess the power of discharging the colour very readily from litmus paper. But the doctrine of equivalents furnishes a very elegant theorem with acetic acid, whose conveniency and accuracy in application I have verified by experiment. An apparently complex, and very important problem of practical chemistry, is thus brought within the reach of the ordinary manufacturer. Since common fermented vinegar is permitted by law to contain a portion of sulphuric acid, which avarice often leads the retailer to increase, we cannot employ it in the present research. But strong vinegar prepared from pyroligneous acid, such as that with which Messrs. Turnbull and Ramsay have long supplied the London market, being entirely free from sulphuric acid, is well adapted to our purpose. With such acid, contained in a poised phial, fully saturate a given weight (say 100 grains) of the bleaching powder, contained in a small glass matrass, applying a gentle heat at last, with inclination of the mouth of the vessel, to expel the adhering chlorine. Note the loss of weight due to the disengagement of the gas. (If carbonic acid be suspected to be present, the gas may be received over mercury.) Evaporate the solution, consisting of acetate and muriate of lime, to dryness, by a regulated heat, and note the weight of the mixed saline mass. Then calcine this, at a very gentle red heat, till the acetic acid be all decomposed. Note the loss of weight. We have now all the *data* requisite for determining the proportion of the constituents without solution, filtration, or precipitation by reagents.

PROBLEM I.—To find the lime originally associated with the chlorine, or at least *not* combined with muriatic acid, and therefore converted into an acetate. *Rule.*—Subtract from the above loss of weight its twenty-fifth part, the remainder is the quantity of lime taken up by the vinegar.

PROBLEM II.—To find the quantity of muriate of lime in the

bleaching powder. *Rule.*—Multiply the above loss of weight by 1.7, the product is the quantity of carbonate of lime in the calcined powder, which being subtracted from the total weight of the residuum, the remainder is of course the muriate of lime. We know now the proportion of chlorine, lime, and muriate of lime, in 100 parts; the deficiency is the water existing in the bleaching powder. Thus, for example, I found 100 grains of a commercial chloride some time kept, to give off 21 grains of chlorine, by solution in dilute acetic acid. The solution was evaporated to dryness: of saline matter 125.6 grains were obtained, which, by calcination, became 84.3, having thus lost 41.3 grains. But $41.3 - \frac{41.3}{2\frac{1}{4}} = 39.65$ = lime present, uncombined with muriatic acid. And $41.3 \times 1.7 = 70.2$ = the carbonate of lime in the residuary 84.3 grains of calcined salts. Therefore, $84.3 - 70.2 = 14.1$ = muriate of lime. Now, by dissolving out the muriate of lime, and evaporating, I got 14 grains of it, and the remaining carbonate was 70.3 grains. Hence this powder consisted of chlorine 21, lime 39.65, muriate of lime 14, and water $25.35 = 100$.

Sulphate of indigo, largely diluted with water, has been long used for valuing the blanching power of chloride of lime; and it affords, no doubt, a good comparative test, though from the variableness of indigo it can form no absolute standard. Thus I have found 3 parts of indigo, from the East Indies, to saturate as much bleaching powder as 4 parts of good Spanish indigo.

Mr. Welter's method is the following:—He prepared a solution of indigo in sulphuric acid, which he diluted, so that the indigo formed $\frac{1}{1000}$ of the whole. He satisfied himself by experiments, that 14 litres (854.4 cubic inches, or 3.7 wine gallons English) of chlorine, which weigh 651½ English grains, destroyed the colour of 164 litres of the above blue solution. He properly observes, that chlorine discolours more or less of the tincture, according to the manner of proceeding, that is, according as we pour the tincture on the aqueous chlorine, and as we operate at different times, with considerable intervals; if the aqueous chlorine or chloride solution be concentrated, we have the *minimum* of discoloration; if it be very weak, the *maximum*. He says, that solution of indigo, containing about $\frac{1}{1000}$ part, will give constant results to nearly $\frac{1}{10}$; and to greater nicety still if we dilute the chlorine solution, so that it shall amount to nearly one-half the volume of the tincture which it can discolour; if we use the precaution to keep the solution of chlorine and the tincture in two separate vessels; and, finally, to pour both together into a third vessel. We should, at the same time, make a trial on another sample of chlorine whose strength is known, in order to judge accurately of the hue. On the whole, he considers that fourteen measures of gaseous chlorine can discolour 164 measures of the above indigo solution, being a ratio of nearly one to twelve. The advantage of the very dilute tincture obviously consists in this, that the excess of water condenses the chlorine separated from combination by the sulphuric acid, and confines its whole efficacy to the liquor; whereas,

from concentrated solutions, much of it escapes into the atmosphere. Though I have made very numerous experiments with the indigo test, yet I never could obtain such consistency of result as M. Welter describes: when the blue colour begins to fade, a greenish hue appears, which graduates into brownish-yellow by imperceptible shades. Hence an error of $\frac{1}{10}$ may readily be allowed, and even more, with ordinary observers.

When a mixture of sulphuric acid, common salt, and black oxide of manganese, are the ingredients used, as by the manufacturer of bleaching powder, the absolute proportions are—

1 atom mur. of soda,	7.5	29.70	100.0
1 atom perox. of mang.	5.5	21.78	73.3
2 at. oil of vit. 1.846	12.25	48.52	163.3
	25.25	100.00	

And the products ought to be—

Chlorine disengaged,	1 atom	4.5	17.82
Sulphate of soda,	1	9.0	35.64
Protosulphate of mang.	1	9.5	37.62
Water,	2	2.25	8.92
		25.25	100.00

These proportions are, however, very different from those employed by many, nay, I believe, by all manufacturers; and they ought to be so, on account of the impurity of their oxide of manganese. Yet making allowance for this, I am afraid that many of them commit great errors in the relative quantities of their materials.

From the preceding computation, it is evident that 1 ton of salt with 1 ton of the above native oxide of manganese properly treated, would yield 0.59 of a ton of chlorine, which would impregnate 1.41 tons of slacked lime, producing 2 tons of bleaching powder, stronger than the average of the commercial specimens; or allowing for a little loss, which is unavoidable, would afford 2 tons of ordinary powder, with a little more slacked lime.

On Blowing Air into Furnaces by a Fall of Water. By the late William Lewis, M. D.

[Continued from p. 303.]

The force of the air may be determined in an easier and more simple method, by means of a glass pipe, open at both ends, with one end fixed in a basin of water. The basin may be hung in the upper part of the tub, or air vessel of our water machines, and the glass pipe let into it, through a hole in the top; what space may remain between the pipe and the hole being properly closed: the pres-

sure of the air upon the surface of the fluid in the basin forces part of it up into the pipe; and this ascent will always be the measure of the power or density of the air. Water is here greatly preferable to the quicksilver, used in the same intention on other occasions, as it discovers smaller variations in the force; for being fourteen times less ponderous than quicksilver, an equal pressure forces it fourteen times higher in the pipe: the whole ascent of quicksilver, by the pressure of the air in the bellows, is so small as frequently not to exceed that part of the pipe which is inserted into the tub. Instead of a glass pipe, a copper or iron one may be used, and the ascent of the water measured, either by occasionally dipping a rod in it, or by means of a hollow copper ball, or other floating body, with a stem standing out of the pipe, and a proper weight below, to keep it upright. It must be observed, that the height of the water in the pipe is to be estimated from the surface of the water in the basin: whence the pipe ought to be of small bore, in proportion to the basin, that the water may not fall considerably in the basin, by the loss of that which rises in the pipe.

Dr. Hales found that a smith's bellows raised a mercurial guage about an inch, so that it would have raised a water guage about fourteen inches. The twenty-five ounces and a half, raised in M. Barthès's experiment, by the blast of the machine of St. Pierre, from an aperture of an inch and a quarter bore, English measure, are equivalent, to the ascent of water in the guage-pipe, forty or forty-one inches. I have been informed that the pipe by which the air is discharged into our iron furnaces, is, at least, of an inch and a half bore; and that the air, with this aperture to pass off by, ought to be of as great density as it can be reduced to by the human breath, in a confined space; which is such as to raise the water in the guage about fifty inches; in which case it is compressed into near an eighth part less volume than it commonly occupies in the atmosphere. But the quality of the fuel, and other circumstances, occasion such variations in this respect, that no general standard can be laid down. I have been assured that a charcoal fire will be excited as strongly, by such a blast as raises the guage thirty-six inches, as a fire of coaked pit-coal will be, by one of fifty inches.

II. *Observations on the air-vessel.*—The structure of the air-vessel, or tub, at the bottom, is, in great measure, independent of that of the rest of the instrument; the same air-vessel serving equally for different kinds and sizes of these machines, while the perfection of the other parts, consists in their adjustment and proportion to one another.

The office of this air-vessel being only to serve as a reservoir for the air, and to suffer the waste water to pass off, no great care seems to be needful for regulating its dimensions; and as the stone which is placed in it under the pipe, serves only to receive and support the fall of water, or to occasion the water to be dashed into small particles, that the air may be more effectually extricated, its distance from the pipe seems also to require no exact adjustment. There are,

however, some particulars in regard to the size of this vessel, and the disposition of some of its parts, which appear to deserve attention.

The guage mentioned in the preceding article, will be a useful addition to it; showing at all times, by inspection, the force of the blast, and thus enabling the workman to judge whether it is sufficient for the purposes intended, and giving him notice of any failings that may have happened in the machine; as whether any air escapes through the joints, or a crack, or whether the choak, or throat of the funnel, is obstructed by stones, or other matters brought by the stream.

All the writers I have met with, who give any account of this kind of blowing machines, seem to suppose the water within and without the air-vessel, to be upon a level. But as the air in the vessel is so far compressed as to be able to raise the water in the guage to a considerable height, it must necessarily act with equal power on the water below it; and if this water can pass off freely at the bottom, it must be depressed, as much as that in the guage pipe, is raised. The water within and without the vessel is exactly in the same situation with that in the basin and pipe of the guage, excepting only that the former receives a continual supply within, which passes off as fast on the outside. The excess of the height of water on the outside of the vessel, above that of the water within, appears to be the very power by which the air is compressed, and driven into the furnace.

To be further satisfied of this depression of the water, I used, for the air-vessel of a small machine, a tall glass, without a bottom; seven or eight inches of its lower part being immersed into a tub of water. As soon as the machine began to play, and the guage to rise, the water within the glass sunk lower than that in the tub on the outside; and the depression of the water, and rising of the guage, were, as nearly as could be judged, equal, and kept pace with one another. In a little time the water was forced quite out of the glass, and the air following it rose in bubbles to the top of the tub.

The bottom of the air-vessel ought, therefore, to be sunk, at least as much below the level where the external water passes off, as the guage is expected to rise; for, otherwise, before the air is sufficiently compressed, to raise the guage to the due height, it will force all the water out below, and in part escape itself by the same aperture. Hence, the depth of the air-vessel, in any of these machines where the water has a free passage at the bottom, gives a power which the force of the blast in that machine can never be made to exceed; thus, at Lead-hills, the water being only of the height of two feet from the bottom of the vessel to the level of the bank where it runs off, the air can never be compressed further than to be able to support a column of two feet of water, or to raise the guage to that height; whereas, in the machine of St. Pierre, the compressure is about two-thirds greater.

The sinking of the water in the air-vessel may, indeed, be prevented, by making the aperture in the bottom, through which the water is discharged, of such a size that the pressure of the air may be able to drive through it no more water than is received at the top. But such

an adjustment would be, apparently, very difficult; and though it should be exactly hit, yet if the quantity of water received was not always the same, it would scarcely be possible to avoid, either a depression or elevation of the water in the air-vessel.

Though the depth of water be sufficient to resist the pressure of the air, it will be easily conceived, that if there were no solid body to support the fall, the great force of the stream, falling from such a height, would push down, or dash about, great part of the water in the bottom, so that the air would get at the hole, and, in part, make its escape with the water. It may be presumed, that even the drops of water rebounding from the stone, and falling down again, have a like effect, though in a lesser degree; for drops falling through the common atmosphere into water, carry air with them, which afterwards rises in bubbles, as may be observed in heavy rains; and it is not to be supposed that the drops should not here also carry into the water some of the compressed air which surrounds them, and is entangled between them. Though part of the air which thus passes into the water doubtless rises again in bubbles, as appeared in using the glass vessel above-mentioned, yet part may also be pushed so low, as to escape through the hole, and discover itself by bubbles in the water on the outside of the vessel, and which I several times observed before the water was driven entirely out of the glass.

M. Barthès likewise takes notice of air being either thus carried down into the water by the drops, or introduced into the cavities which they form in falling. In order to prevent it, he recommends making a partition across the tub at the level of the stone, with only a hole at one side, and this in the part most remote from the pipe through which the water falls; the rebounding drops are received upon the board, and run off gently through the hole in the water underneath.

The inconvenience may be prevented also, as effectually, and with more advantage in other respects, by making the air-vessel of a very considerable depth, below the surface of the stone; it may be sunk several feet into the ground, below the level of where the outward water runs off, so as always to have a column of water in the vessel, of any height required, or of a height which shall prevent any air from passing down to the bottom. This structure would free the workman from any care about increasing or diminishing the aperture, or regulating the height of the water; for, if the deep vessel has an aperture in its lower part, large enough to discharge all the water that can fall into it through the pipe in the top, or, for the greater security, a great deal larger, its magnitude being of no inconvenience, if this vessel is sunk into a pit of water, up to the level of the stone, or to a certain height above it, and if the pit has a drain sufficient to carry off what more water it may receive, we may be sure that the water will be always high enough in the vessel; because the pressure of the water on the outside will keep it so, and the pressure of the air within the vessel, will always keep it below the surface of the stone.

*The air extricated from the water is always moist;** when let off at a little way above the stone, I have often observed it to have drops like dew on any solid body opposed to it.

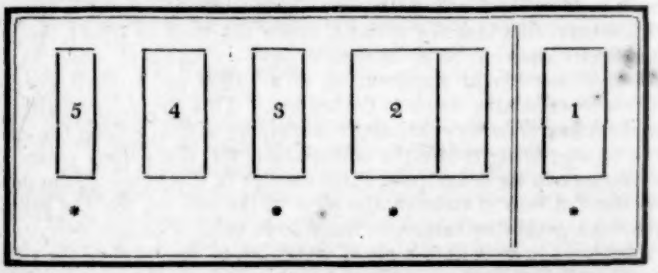
The joints should be well secured, to prevent the escape of any air through them: the stone for receiving the dash of water, should be placed as much below the level of where the water runs off, as the guage is expected to rise, and the pipe should reach as low as within five or six inches of the stone. It would, perhaps, be of some advantage, to have the surface of the stone a little concave, so as to occasion the watery drops to be rather dashed backwards towards the stream, than thrown upwards, through the cavity of the vessel.

[TO BE CONTINUED.]

A descriptive Account of the several Processes which are usually pursued, in the Manufacture of the Article known in Commerce by the name of Tin-Plate. By SAMUEL PARKES, F. L. S., *&c. Abridged for the Boston Journal of Science, from a paper read before the Philosophical Society of Manchester.*

[Continued from p. 328.]

IN the first place, the wash-man prepares an iron pot which he nearly fills with the best grain tin in a melted state—another pot of clean melted tallow, or lard free from salt—a third pot with nothing within it but a grating to receive the plates—and a fourth, called the *listing-pot*, with a little melted tin in it, about enough to cover the bottom to the depth of a quarter of an inch. The whole will, however, be better understood by referring to the following drawing, which exhibits the several vessels in the order in which they stand in the manufactory, all supported by substantial brick work.



The building in which the pots are fixed is called the *Stow*. The plates are worked from the right to the left of the stow, as will be evident by attending the uses of the several pots.

* Hence its superior value for exciting the fires of forges, steam-engine boilers, &c.; and Mr. Nicholson endeavoured to increase its *moistness*, by the admixture of *steam* with it. EDITOR *Tech. Rep.*

No. 1. Represents the tin-pot.
2. The wash-pot with the parting within it.
3. The grease-pot.
4. The pan, containing a grating at the bottom.*
5. The list-pot.

The drawing represents the *surface* of the pots. The asterisks show the places where the workmen stand, and also mark those pots which have heated flues under them. No. 4 has no fire under it.

The parting in the wash-pot No. 2, is a late improvement. The design of it is to keep the dross of the tin from lodging in that part of the vessel where the last dip is given to the plates. By using the *common* tin in the first process of tinning, much oxide, or dross, adheres to the surface of the plates, and this runs off in the wash-pot, and comes to the face of the new metal—but this parting enables the operator to prevent it from spreading over the whole surface of the pot. Were it not for this parting, the wash-man must skim the oxide off the fluid metal every time he puts plates into it.

The pots, of which I have given a sketch, being all in a state of fitness, the wash-man commences his part of what remains of the business, by putting the plates, which have undergone the various operations hitherto described, into the vessel, of grain-tin, called the wash-pot.† The heat of this large body of melted metal soon melts all the loose tin on the surface of these plates, and so deteriorates the quality of the whole mass, that it is usual, when sixty or seventy boxes have been washed in the grain-tin, to take out the quantity of a block, say three hundred weight, and replenish the wash-pot with a fresh block of pure *grain*-tin. These vessels generally hold three blocks each, or about half a ton weight of metal. That which is taken out of the wash-pot when it is replenished with pure metal, is given to the tin-man to put into his pot.

When the plates are taken out of the wash-pot, they are carefully brushed on each side with a brush of hemp of a peculiar kind, and made expressly for the purpose. As this part of the business requires considerable adroitness and expedition, it may be worth while to explain it a little more in detail.

The wash-man first takes a few plates out of the wash-pot, and lays them together before him on the stow,—he then takes one plate up with a pair of tongs, which he holds in his left hand, and with a brush held in his right hand brushes one side of the plate—he then turns it, and brushes the other side, and immediately dips it once more into the hot fluid metal in the wash-pot, and without letting it out of the tongs, instantly withdraws it again, and plunges it into the grease-pot (marked No. 3.) adjoining to the wash-pot from whence he had just taken it.

* This pan is designed for the reception of the plates as the boy takes them out of the grease-pot. It has no fire underneath it.

† None but *grain*-tin is ever put into this vessel, for the whole of the common tin which is consumed in such manufactories, is used in the *first* process, viz. that which is called *tinning*.

A person who has not seen the operation, can form but a very inadequate idea of the adroitness with which this is performed—practice, however, gives the workman so much expedition, that he is enabled to make good wages, although he obtains only three-pence for the brushing and metallic-washing of 225 plates. I am informed that an expert wash-man, if he makes the best of his time, will wash 25 boxes, consisting of 5,625 plates, in twelve hours; notwithstanding every plate must be brushed on both sides, and dipped twice into the pot of melted tin.

Why the plates should be dipped *twice* during this part of their manufacture, may perhaps require some explanation. It must be recollected that they are brushed quite hot, and before the tin is set, therefore, if they had not the last dip, the marks of the brush would be visible. Moreover, the brush takes the greatest part of the tin off them, so that if they were removed to the grease-pot without being re-dipped, the hot grease would take off what remained.

The only use of the grease-pot is to take off any superfluous metal that may be upon the plates—but this is an operation that requires great attention, because, as the plate is immersed in the grease while the tin is in a melting, or at least in a soft state, upon it, a part *must run* off, and the remainder becomes less and less while the plate continues in it; therefore, if these plates should ever be left in the melted tallow longer than is absolutely necessary, they will doubtless require to be dipped a third time in the tin. On the other hand, if the plates were to be finished without passing through the grease, they would retain too much of the tin, which would be a loss to the manufacturer, and, besides, the whole of the tin would appear to be in *waves* upon the iron.

It is also equally necessary to attend to the temperature of the melted tallow, which must be colder or hotter in proportion as the plates are thicker or thinner; for if, when the tallow is of a proper temperature for a thin plate, a thick one was to be put into it, it would come out, not of the colour of tin as it ought to be, but as yellow as gold. The reason of this is evident. The thick plate contains more heat than a thin one, and consequently requires the tallow to be at a lower temperature. On the contrary, if a parcel of *thin* plates were to be worked in a pot of tallow which had been prepared for *thick* plates, such a pot would not be hot enough to effect the intended purpose.

It is a common observation that, in most of our manufactures, and in all chemical speculations, theory and practice are generally at variance; but there are few manufactures, perhaps, where there are so many minutiæ which would escape the notice of a casual observer, and yet that require to be carefully attended to, in order to produce a good result, as in that which we have now been describing—and should the perusal of this paper occasion but one individual to pause, who was about to enter into a new concern with which he was only partially acquainted, I shall have written to a good purpose.

But to return to the process. When the plates are sufficiently brushed, they are again immersed, one by one, in the pot of melted

tin, as has already been remarked, and immediately from this, they are put into the pot of tallow above mentioned. This pot has pins fixed within it, in such a manner as to keep the plates from touching each other: and this part of the process is conducted in the following manner:

When the wash-man has passed *five* of the plates through the melted tin, and from thence into the pot of tallow above mentioned, a boy takes out one of them and puts it into the empty pot to cool, and the wash-man puts it into the *sixth* plate. The boy then takes out a *second* plate, and lays it to cool likewise, when the man puts in his *seventh*, and so they go on, in this regular manner, until the whole of the parcel is finished.

In consequence of the plates being immersed in the melted tin in a vertical position, there is always, when they have become cold, a wire of tin on the lower edge of every plate, which is necessary to be removed, and this is done in the following manner:

A boy, called the list-boy, takes the plates when they are cool enough to handle, and puts the lower edge of each, one by one, into the list-pot, which is the vessel that was before described as containing a very small quantity of melted tin, and the same as that which I have marked No. 5. When the wire of tin is melted by this last immersion, the boy takes out the plate, and gives it a smart blow with a thin stick, which disengages the wire of superfluous metal, and this falling off, leaves only a faint stripe in the place where it was attached. This mark may be discovered on every tin plate which is exposed for sale; the workmen, in the manufactory of them, call it the *list*.

Nothing now remains but to cleanse the plates from the tallow. This is done by means of bran, and as they are cleansed they are put into strong wooden boxes, or boxes of *sheet-iron*, made exactly to fit them; and this completes the whole business.

Method of Eradicating the Stumps of Trees.

[Abbreviated from the Transactions of the Society of Arts.]

In the clearing of woodland the extirpation of stumps and roots is the most laborious part of the process. In British America, the ordinary method is to allow the stumps to remain for a number of years, according to their size. During this period the smaller fibres gradually decay, and the root itself is each year removed a little from its original position, by the frost. When the farmer judges that time has so far produced decay as to render the removal of the stumps and roots practicable by the usual means, he pitches upon the spring of the year when the soil has been loosened by the returning heat, and with the assistance of four or five men, and a couple of pairs of oxen, he effects his purpose, by a great deal of labour, and under a disadvantageous application of power, owing to the softness of the ground.

In 1821, J. Mackay, Esq. of Pictou, Nova Scotia, cut down the trees and removed the timber from a field of 10 acres. The following were the means adopted by that gentleman for clearing the ground of the stumps and roots, which proved so effectual, that, with the assistance of four men, he cleared, upon an average, 80 stumps a day, and with them every root which could impede the progress of the plough.

A ship's winch, or moveable crane, was the machine used for gaining a great mechanical power; this was brought into the middle of about an acre of stumps, and fastened to the largest of them. From the barrel of the winch a chain proceeded, which extended to the farthest stump in the piece; a number of shorter chains were also provided, each having a ring at one end, and a hook at the other. By passing the hook through the ring, they were fixed upon the stumps nearest to that to which the chain of the winch was attached; and when it was raised, these chains were, in succession, hooked to the leader, so that the winch was employed without interruption, till the nearest stump was extracted. In clearing Mr. Mackay's field, five hands were employed; two at the winch, two in fixing the chains, and one at the stump to be raised. When the stump was large, those who attended the chains occasionally assisted in turning the winch.

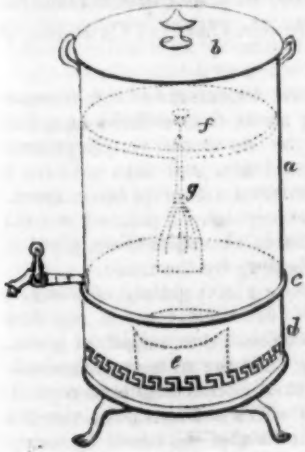
Reference to Engraving.—*a a* the two winch handles of the frame *b b*, which is chained to the largest stump, *c; d d* the leading chain, proceeding from the barrel to a distant stump *e*, which is in the act of being raised. *g* a shorter chain round the stump *h*, to be hooked on to the leading chain *d d*, as soon as it has raised the stump *e*, and has been disengaged from it, so that the different stumps are raised in succession from the farthest to the nearest. The winch is then removed to face the next portion, and the chain extended to the farthest it can reach, while the shorter chains are attached to the right and left stumps, and hooked on, in succession, to the leading chain, and thus continued until a whole circle round the winch has been cleared. Should the stump to which the winch is attached, be liable to give way, it will be requisite to lash it to one or two in the rear, to secure the purchase.

Evans's *Improved Coffee Urn.*

In the ordinary method of roasting coffee, it is well known to chemists, that acetous acid is generated; and when the berry is subsequently ground and infused, this acid is given out in a greater or lesser quantity, according to the time the coffee remains in the liquor. To obviate this inconvenience, an apparatus was contrived (called a *biggin*) in which the coffee is put into a bag suspended to the rim of the vessel, and boiling water having been poured through, it is separated from the liquor as soon as the infusion is made. In this manner an infusion is produced nearly free from acid, and possessing much of the aromatic fragrance.

In the coffee roasted by the *patent* apparatus, the ingenious inventor has contrived in his process to get entirely rid of the acetous acid; it follows, therefore, that in making an infusion of the patent coffee, there is no necessity for keeping the water separate; and, consequently, that an infusion of a much richer quality may be obtained by allowing the powdered coffee to lie a considerable time immersed: and hence it has been observed, that the last cup is better than the first, while it is the contrary in ordinary coffee.

Now the process adopted with the biggin is an uneconomical one, as the water, being merely poured through the powdered coffee, or immersed for a short time, dissolves only a small portion of the soluble matter; consequently much of the rich properties is abandoned in order to avoid the acid, and retain the aromatic parts. In the patent coffee there is no acid to be extracted, therefore the infusion may be continued until all the nutritious matter is obtained from it; but as the fragrant principle is of a very volatile nature, and as the retention of it to the greatest extent is a desideratum in coffee-making, Mr. Evans has contrived the apparatus delineated below, which answers the purpose extremely well.



a shows the body of the vessel to be of a cylindrical form, *b* is the cover or top, and *c* the bottom; *d* is the stand, containing a cylindrical recipient for a lamp or a heater; *f* is an air-tight, *floating* piston, with a hook underneath, for suspending the bag of ground coffee *g*.

The floating piston is made of two thin metal plates, with a hollow space between them, capable of holding a sufficient quantity of air to render itself and the bag of coffee, buoyant; the peripheries of the plates are connected by a rim at right angles, and properly soldered. The piston is, of course, accurately fitted to the cylinder, but so loosely as to allow it to rise and fall

with the liquid on which it rests, quite freely. By this means the surface of the liquor is preserved from the contact of the air, and notwithstanding the liquid is at a boiling heat, no perceptible vapour arises, which might be supposed would escape by the edges of the floating piston; the aromatic principle is thus wholly retained, or very nearly so, until the last cup of coffee is drawn off. The air having no access to the liquor, it boils at a lower temperature, and is kept hot for a much longer time.

When coffee is ground to a fine powder, and placed loosely among the water, the floating particles are a long time in subsiding; in such cases, the addition of a small quantity of animal gelatine is resorted to, to expedite the clearing; and to save the trouble of this operation, the suspending of the coffee in a bag was introduced. Mr. Evans has, however, found, that when coffee is thus suspended in a mass, a great portion of the extractive matter remains in it, undissolved; he has therefore suggested a further improvement, and is now, we are informed, having an urn made accordingly. In this, the coffee is to be contained in a cylindrical box, which is to rest upon a ledge at nearly the bottom of the urn, occupying the whole of its area; the top and bottom of the box to consist of two fine strainers, similar to those used in sieves. The water will be supplied by means of a tube extending from the top of the vessel to the bottom, from whence it will ascend through the strainers, and the coffee contained between them; which, being unconfined, every particle will be kept in agitation by the boiling water, and fully operated upon. The floating piston, which is by far the most valuable part of the invention, will, of course, be employed in this improved modification, as in the one previously described.

Method of making a cheap Soda Liquor, without Crystallizing, for the use of the Turkey-red Dyers. By Mr. CHARLES CAMERON, *of Glasgow.*

As the Turkey-red dyers are the great consumers of the common soda of commerce, it occurred to me, about four months ago, that they might make their own alkali, by the cheap and simple process of decomposing muriate of soda by pearl-ash, and thus procure a liquor equally pure, without the tediousness and expensive operation of bringing the soda to the state of crystal. I pointed out the following plan to a Turkey-red dyer here, who immediately put it in practice, and it is now gradually adopting by the trade.

Into a cast-iron boiler capable of holding 450 gallons of water, I put ten hundred weight of pearl-ash (first sort,) seven hundred weight of muriate of soda, and four times this latter weight, of water, applying heat, and stirring the mixture until the salts are dissolved. After boiling for some time, the muriate of potash begins to crystallize on the surface. As the boiling is still continued, the muriate of potash is rapidly forming, and is lifted out of the vessel by means

of a ladle pierced with small holes, and is thrown into a vessel placed in an inclined position, with its end, or side, a little within the edge of the boiler, which allows any of the liquor that may have been carried over, to drain back again into the pot. The boiling is continued until nearly the whole of the muriate of potash is deposited and taken out. The liquid is then removed into another vessel, either of cast iron or wood lined with lead, and allowed to remain until it has cooled to the temperature of sixty degrees, during which time it parts with the rest of its muriate; it is then run off into another vessel, and diluted with water to twenty degrees specific gravity, more or less, at pleasure, which prevents the soda from crystallizing, and gives a uniform strength of liquor, equally pure with the best crystallized soda, and at about half the price. The above weight of pearl-ash and muriate of soda, produces a mineral alkali equivalent in quantity to what is contained in one ton of soda of commerce, the best of which does not exceed 22 per cent.

	£.	s.	d.
Present price of soda, 22*l.* per ton,			
Price of pearl-ash, first sort, per ton, . . .	28	0	0
14 cwt. of muriate of soda, 30*s.* per ton, . .	1	2	0
	29	2	0
These produce 1¼ tons of muriate of potash, price 5*l.* 10*s.*	6	17	6
Cost of alkali, equivalent to 2 tons of soda, .	22	4	6

The process is so simple, that one workman can decompose one or more tons per day, dependent on the size of his vessels. As the Turkey-red work consumes from forty, to two hundred and fifty, tons annually, according to the extent of its establishment, it is of great importance to that valuable manufacture. I can claim no merit in merely decomposing muriate of soda by potash, as that is a fact long known; what properly belongs to me, is, being the first to point out to the trade a simple and unexpensive method of making their own alkali, without being at the expense of erecting additional premises, and extensive apparatus, required for the purpose of crystallizing; a common boiler and two or three other vessels being all that is requisite.

Rolling Press for Bookbinders, by Mr. W. BURN, *of Kirby street, Hatton-garden, London.*

[From the Transactions of the Society of Arts.]

A COMMITTEE met at Mr. Burn's house, for the purpose of examining the rolling press employed by him as a substitute for the beating which books require previous to being bound. The press consists of two iron cylinders about a foot in diameter, adjustable in the usual way, by means of a screw; and put in motion by the power

of one man, or of two if more convenient, applied to one or two cranked handles. In front of the press sits a boy who gathers the sheets into packets, by placing two, three, or four, upon a piece of tin plate of the same size, and covering them with another piece of tin plate, and thus proceeding by alternating tin plates and bundles of sheets, till a sufficient quantity have been put together, which will depend on the stiffness and thickness of the paper. The packet is then passed between the rollers, and received by the man who turns the winch, and who has time to lay the sheets on one side, and to hand over the tin plates by the time that the boy has prepared a second packet. Among other books that were pressed in presence of the committee, was a minion bible, which was passed through the press in one minute, whereas the time necessary to beat the same, would have been twenty minutes. It is not, however, merely a saving of time that is gained by the use of the rolling press, the paper is made smoother than it would have been by beating, and the compression is so much greater, that a rolled book will be reduced to about five-sixths of the thickness of the same book, if beaten. A shelf, therefore, that will hold fifty books, bound in the usual manner, would hold nearly sixty of such, if bound in Mr. Burn's manner; a circumstance of no small importance, when it is considered how large a space even a moderate library occupies, and that book-cases are an expensive article of furniture.

Illuminated Clock Dials.

We are happy to observe that this very simple and ingenious mode of increasing the utility of turret clocks, is now coming into very general use. Our readers will no doubt recollect, that the iron church at Glasgow, was first illuminated by means of a parabolic reflector; and since that, the metropolis has furnished three very successful instances of the employment of transmitted light for the same purpose. They are now enabled to add another large clock to the list, as the church clock of St. Mary, Islington, was illuminated on February 25, for the first time. The dial is the largest which we have yet seen; the diameter to the extremity measures nine feet, and the illuminated part, eight feet; the length of the figures, fifteen inches; the minute hand, four feet, and the hour hand, two feet nine inches; the height of the dial from the ground is sixty-five feet. As the clock struck seven, the gas was turned on, and the joy-bells rang a merry peel: the effect was very beautiful, and the crowds who had assembled before the church, testified their approbation by repeated cheers. The clock can be seen in both roads, and very distinctly from Cloudsley Terrace—a distance of about three quarters of a mile. Its utility is quite manifest, particularly to those who travel by night: and where it has been adopted upon the principles approved of by the Society of Arts, namely, in St. Giles's and Whitechapel, it

has given great satisfaction. Each of the diameters of the dials in the two latter places, does not exceed six feet and a half, being less than the one in Islington by two feet and a half.

Some account of the Manufacture of Glass in India: extracted from a journey through the countries of Mysore, Canara, and Malabar. By FRANCIS BUCHANAN, M. D.

NOTWITHSTANDING the extent of the British possessions in India, we know but little of the actual state of the manufactures of that country. It is true, that within a few years, considerable information has been given upon this subject, but this information is generally contained in large and expensive works, not accessible to the greater number of readers. From what has appeared, it is evident that the artisans and manufacturers of England, and of this country, can derive but little practical benefit, from the knowledge in question, as the materials employed, in most instances, differ essentially from those at our command; and the processes, and instruments of manufacture, are of a very rude kind, bearing little or no analogy to the machines which, in our workshops, appear to operate without human agency. The east Indian seeks for no improved method, which shall enable him to cause a few to perform the labour of the many; the political and moral institutions which control his actions, and form his habits, forbid such a thought; his very life depends upon the continuance of the existing state of things. An account of the arts of India is, therefore, much better calculated to gratify our curiosity, than to improve our processes.

We have not the work from which the subjoined extracts are made, but copy them from Mr. Gill's Journal, and shall hereafter give some further information on the same subject, from the narrations of other residents in India. EDITOR.

I went to Chinapatam or Chinapattana, which was formerly the residence of a Polygar family, who seem to have risen into power about five centuries ago.

Glassware is one of the manufactures of this place. It is made by two operations. In the first, from the raw materials are formed masses of glass; in the second, these masses are wrought up into small bottles and ornamental rings for the arms of women.

Two or three of their furnaces are in general constructed in the same building, which is erected in form of a terrace against one of the walls of a yard, and which, where there are three furnaces, may be six feet high, twelve broad, and twenty-six long. The furnace is arched over, and, in the centre of the summit, has a round opening, about two feet in diameter. This is covered by a flat stone, in the centre of which there is an aperture. Near the level of the surface of the ground, within the furnace, is a shelf or platform, which has also an aperture in its centre. This platform thus divides the

furnace into two different cavities, the lower of which contains the fuel, which is introduced through an opening at the bottom of a niche, or arched vault, that is formed in the front of the terrace. The crucibles containing the materials are introduced at the opening in the summit of the furnace, and placed in a circle on the platform. This opening is then closed with the flat stone, and the air is excluded by covering the stone with moist clay. The small hole in the stone is, however, left open. The fire-place is then filled with wood, and the fire is managed according to the nature of the materials which the crucibles contain.

For making green glass take of the following articles according to apothecary's weight:—

	lb.	*oz.*	*dr.*	*scr.*	*gr.*
Broken glass	14	9	0	0	0
Banaji Callu, powdered white quartz	14	9	0	0	0
Loha (an old button, like brass, was given to me as a specimen)	0	3	2	1	13
Copper	0	2	9	1	16
Cariculla, iron ore with manganese	0	2	1	2	2
Soula, or impure soda	29	6	0	0	0
	58	11	5	2	11

This is the charge for one crucible.

In making red glass the *loha* is left out. Forty-four crucibles stand in one furnace. A small quantity of the materials is assayed in the furnace used for blowing the glass,* and if the soda prevails too much, an addition is made to the quartz.

In order to vitrify these materials, burn on the first day ten bundles of firewood. Next day put out the fire by stopping the access of air to the furnace. Next day put in fresh wood and keep up the fire for eight days; but no supply of fuel is given at night. The fire of course goes out towards morning. Afterwards the fire must be kept up night and day, till the glass be melted; which is known by putting an iron rod into the crucibles through the small hole in the flat stone. This requires from four to six days more. The fire at first is put out with a view of preventing, by this means, the glass from being injured, by the smoke: but it is not easy to conceive any chemical operation more injudiciously conducted than this is. The alkali is never saturated, and effloresces from the glass when that is kept any length of time. Each crucible ought to produce forty-one pounds, three ounces, four drachms, two scruples, and eight quarters of glass, worth seven sultany fanams, or four shillings and eight pence half penny.

The contents of one crucible for black glass are:—

	lb.	*oz.*	*drs.*
Quartz	14	9	0
Soda	29	6	0
Broken glass	22	1	4
	66	4	4

* Figures of both these furnaces will be given in the sequel to these extracts.

In eight or nine days this is vitrified by a fire burning constantly, and produces about forty-four pounds and a half, worth four and a half fanams, or a little more than three shillings.

The ornamental rings are made as follows:—a circular cavity, about two feet and a half in diameter, is dug in the floor of the work-shop, and is covered by a flat dome of baked clay. In this are four perforations around its lower edge. By one of these, the fuel, which is charcoal, is introduced down an inclined plane leading to it. The three other openings are for the workmen to take out the glass, which is put into a flat earthen crucible, formed like a soup-plate, and supported by a bracket, or shelf, of baked clay. When the glass is melted, two workmen sit down at each of the three openings, six men in all, to each furnace, with an assistant to keep up the fire. One man of each pair introduces the point of an iron rod, and turns it round among the melted glass till a sufficient quantity adheres to it. He then takes out the rod, and with one hand gives it a quick rotatory motion on a stone that is placed before him. With the other hand he applies a knife, and forms the glass into a ring, round the point of the rod. He then pushes the ring into the furnace, and there gives it a quick rotatory motion, so that the liquid glass, by the centrifugal force, assumes an elliptic form. The rod is then withdrawn, and the ring is dilated by inserting the point of the knife between it and the rod. It is then pushed on to the point of a cone managed by the other workman, who also gives his cone a rotatory motion, and pushes up the ring upon it, till it becomes of a proper size. He then polishes it, while it is cooling, by applying his knife to the surface, all the while continuing the rotatory motion. The work is carried on with considerable dexterity, and the two men make about ten rings in a minute.

These rings are universally worn by the women of the Decan as an ornament to the wrists, and their applying closely to the arm is considered as a mark of delicacy and beauty; for they must, of course, be passed over the hand. In doing this, a girl seldom escapes without drawing blood, and rubbing part of the skin from her hands; and as every well-dressed girl has a number of rings on each arm, and as these are frequently breaking, the poor creatures suffer much from their love of admiration; but in the female breast this is a more powerful motive than the dread of any common pain.

The soda, or fossil alkali, is found in the soil near Madura, and at Gutalu, a town east from Mundium. In the hot season the glass-makers go to these places and prepare as much as they want. They collect the soulu munnu, or saline earth, into heaps, and near these dig three pits, which I shall call A, B, C. The pit A, in the centre, is a square of four cubits in extent, and one foot in depth. The pit B, is circular, three and a half cubits in diameter, and two and a half in depth. The pit C, is a small circular cavity, capable of containing four or five pots of water, and communicates with the pit A by means of a small channel, which can be occasionally shut up with clay. When all things are ready, the pit B is filled nearly with soulu munnu, and then is added a little water, which is mixed well with the saline

earth, so as to form a thin mud. This is then put into the pit A for two hours, when the earth subsides and leaves a clear water impregnated with alkali, which is allowed to run off into the pit C. Some of this water is then put into a fourth pit, and mixed with cow-dung. The mixture is allowed to putrify for three days, and is then spread on forty mats, by means of the twig of a tree, which retains its leaves. When dry, this forms a very thin crust on the mats, which are then laid on the ground and exposed to the sun. Every day afterwards these mats are sprinkled with fifty pots of the clear brine from the pit C, procured as above-mentioned. This is continued for twenty days, when a cake of soda about half an inch in thickness, is formed all over the mats. It is very impure, and sells for two paissas the cucha seer, thirteen shillings and nine pence farthing, the hundred weight. It is used for washing, and for making glass. Large quantities of it are said to be brought from Ellandura, a town about forty miles east from Mysore.

On the Manufacture of Iron and Steel in India: from "A Journey from Madras, through the countries of Mysore, Canara, and Malabar." By FRANCIS BUCHANAN, M. D.

Of the Iron Ore.—At Ghettipura I not only found the ore in several places, but also the pits from which the people were then actually taking it to supply their furnaces. I am at a loss for the desire of concealment relative to minerals amongst the natives, which also extends to every kind of quarry throughout the country, and which equally pervades the officers of government and the other inhabitants. Men who have given me, apparently, correct information relative to their farms, have eagerly denied a knowledge of the fossil kingdom, which they no doubt possessed, and for which denial I can assign no plausible motive. The late sultan (Tippoo Saib,) indeed, is said to have harassed his subjects exceedingly, by making them work at quarries, and also to have been very severe on the smelters of iron; and the people may have suspected that my inquiries might lead to similar oppressions; but, according to the iron-smelters' own account, the sultan gave them a high price for their iron, and by his great demand afforded them constant employment. It is probable, however, that he compelled them to work much harder than they were inclined to do, and that they were defrauded by those who were entrusted with the payment.

Much steel was formerly made at Ghettipura, from whence it derives its name, which signifies, literally, *hard town*. It is a small village, near Sevendroog. Near it are many cultivated fields, intermixed with low rocky hills. The ore is found both in the fields and hills.

The iron ore of the fields consists of small irregular masses, sepa-

rated by thin layers of earthy matter, and is found in beds, that are from five to ten feet deep, which have only been wrought in a few places, when they come so near to the surface, that they have been discovered by the plough. It is probable, that by digging deep, they might be found to be of great extent. The small masses are easily beaten into powder, and then the black sand is readily separated, by washing, from the clay and sand that are the other ingredients in their composition. This ore is of two kinds; one efflorescing into red ochre, the other into yellow. Intermixed with both these kinds of ore, which are called female stones, are many lumps of what the natives call male stones. It appears to me to be composed of the same materials with the female stone, but is so hard, that the imperfect manipulations of the natives cannot reduce it to a powder, and of course they cannot separate the earthy matter. It is therefore looked upon as useless, fluxes being entirely unknown to the miners of Mysore. The female stone appears to me to be the male in a state of decay.

The iron ore of the hills is also male and female, the latter being the only one used; and this is also, in my opinion, the male in a state of dissolution (decomposition.) The male stone in the hills bears a much larger proportion to the female, than it does in the fields. This ore is also found in digging a very little depth into the soil, and seems to be the source from whence most of the black sand of the country is washed by the rain.

The female stone is very easily reduced to powder, and the iron-sand is readily separated, by washing, from the quartzose-sand, which is the other ingredient in the ore. It is not so rich in metal as the ores found in the fields. These two ores are called *Aduru Cullu*, or stones containing iron-sand.

On the surface of the hills is found another iron-ore, called *Ipanada*, which is scattered among the gravel in small lumps, from the size of an egg downwards. They are a pure ore, and are put in the furnace without any preparation, except breaking the larger pieces into bits about the size of a filbert. The quantity of *Ipanada* required for one furnace is exactly the same, by measure, as that of *Adura;* but the weight of *Ipanada* is of course less, there being more space occupied by interstices, from the greater size of the pieces. The produce in iron from both is the same. The surface of the lumps of Ipanada is often covered with a kind of black enamel.

During the four months of heavy rains, four men are also able to collect as much sand in the channels of the torrents, as a furnace can smelt in the remainder of the year. In order to separate the earth and sand from the ore, it requires to be washed. These men get ten *harams*, or six shillings and eight pence half-penny, a month, and the nature of their service is similar to that of the farmers' servants, being bound by occasional advances of money to continue in the employment of their master. During the remaining eight months of the year they work at the forge.

The smelting furnace is made in the front of a square mound of

clay, sloping up gradually from behind forwards.* In the front the mound is twenty-two inches high, and three feet broad. In this mound, from top to bottom, is made a semi-cylindrical cavity, about a foot in diameter. On the ground, in front of the cavity, is laid a square hearthstone, six inches thick, a foot long, and a foot broad. Contiguous to this is placed another stone upright, a foot square, and two inches thick. On the top of this last stone is fixed a small piece of timber, having a hole in it, through which the nozles of the bellows pass, and behind which rises another mound of clay, sloping upwards gradually, and widening as it recedes from the furnace; on this mound rest the two pairs of bellows. Each pair of bellows consists of a whole buffalo's hide, removed from the carcase of the animal without cutting it lengthwise. Where it has been cut at the neck, it is sewn up, so as to leave a small opening for a wooden nozle, which is made fast to the piece of timber before-mentioned. The hinder part of the skin is slit vertically, and the one side or flap is made to lie over the other, two slips of bamboo-cane being stitched, one to each flap, to open or close them by. In the middle of the outer end of the bellows is fastened a ring of leather, through which the workman passes his arm, and seizes the ends of the bamboo slips, which serve as handles. When he draws back his arm he suffers the slips to extend, and the opening in the hinder part of the skin is dilated, and admits the air; when he forces his arm forwards and downwards, the opening is closed up, and the air is forced forwards through the nozle of the bellows. The lower part of the bellows is retained in its place by a rope fastened to its lower angle, and supported by an elastic piece of timber, which is fastened to one of the posts of the hut, like the pole of a turner's lathe. The nozles of both the bellows are inserted in one common tube, which is made of baked clay, and is placed in a sloping direction, so as to pass through a mass of moist clay, that occupies the front of the furnace above the first-mentioned stone or hearth. Above this is placed a large tile; and the empty spaces between this and the first-mentioned mound are filled up with moist clay. The furnace is now made cylindrical, and open at top, on which is placed a chimney, made of baked clay, in the form of two truncated cones joined together by the apices. Of these, the upper cone, or hopper-shaped mouth, is by far the shortest. From this description, it must be perceived that the whole lower front of the furnace is moveable, and when it has been newly built up, a little charcoal is burned in it for an hour, to dry the moist clay by which the various parts are connected. The rents formed during this operation must be carefully closed with more clay, and the furnace is then ready for immediate use.

For smelting the black sand, the following is the process. A quantity of the sand is measured out, and divided into three parts, each of which I found to weigh a little more than twenty-five pounds eleven ounces, avoirdupois. Three baskets of charcoal are then set

* Figures of this and other furnaces will be given in the sequel of this article.

aside, of which each contains about a bushel. Two of the baskets of charcoal are then put into the furnace at the top of its chimney, and above these one-third part of the sand. The fire is then kindled, and urged with the bellows. When the fire subsides, one half of the remaining charcoal, and another third of the sand, are put in; and when these have again subsided, the remainder of the sand and charcoal is added, and the fire is urged six hours and a half from the commencement. The front of the furnace is then broken, and on removing the walls, a mass of iron is found at the bottom, which is taken out with tongs, and cut into blocks, each weighing half a maund, or a little more than twelve pounds two ounces. By this it would appear that the ore produces no more than about thirty-one and a half per cent.; and the iron so produced, although malleable at first, is exceedingly impure. Tippoo took it from the workmen at three fanams a maund, or nine shillings and three pence half-penny a hundred weight. He gave them, however, great employment, as he made his shot of this iron, by hammering, for the fusion is never so complete as to allow it to be cast in moulds.

In order to render this iron more pure, and to fit it for being wrought up into the implements of husbandry, it is taken to another house, and repeatedly forged. There are here also two pairs of bellows, but they are smaller than those in the smelting-house; and the mound on which they are supported being low, a pit is formed behind it, in which the labourers stand, in order to place them on a proper level for their work. The nozles of the bellows are inserted into an earthen tube, which conveys the air into the furnace through one of its side walls. These walls are two masses of clay, one cubit long, ten inches high, and four inches thick; and are placed on the floor, parallel to each other, at the distance of a foot. On them is laid a flat cover made of baked clay, and about an inch and a half in thickness. In its hinder part is an oblong opening, sufficient to admit one of the blocks of iron. The fore part of the furnace is secured on the top by a moulding of clay, which is somewhat ornamented. Before it is placed a stone, a cubit long, twelve inches broad, and three high. Except what is shut up by this stone, all the fore part of the furnace is open. The hinder part is entirely shut up with clay, except a small opening, by which the ashes and vitrified scoriæ fall into the ash-pit.

A block of iron from the smelting-house having been put into the centre of the furnace, it is filled with bamboo charcoal, and strongly heated; while another block is put into the upper opening, to receive some heat as a preparation. When the first block is properly heated, it is placed on an anvil, and receives a few strokes of large hammers from three workmen, who stand in three sunk cavities, formed around the anvil, to reduce them to a proper level, and who thus knock off some ill smelted portion of it, and much of the adhering scoriæ. With a kind of hatchet (chisel) the block is then cut into three wedges, and in this operation the workmen show much dexterity. The second piece is then put into the centre of the furnace, and a third piece is placed in the upper opening of the furnace; while these

are heating, the three wedges are again made red hot, and well beaten on an anvil by the three workmen with large hammers. In this state the six wedges produced from one smelting, weigh twenty-four seers, or a little more than fourteen pounds and a half, avoirdupois, and are sold to the blacksmiths, who are, however, obliged to heat and beat the iron three or four times before it is fit for making the implements of husbandry. The weight of the six wedges is then reduced to fifteen seers, a little more than nine pounds; and they sell it at from two to three fanams, or from about one shilling and four pence, to two shillings; that is, from about sixteen shillings and six pence, to twenty-four shillings and nine pence a hundred weight. From this it appears, that the good malleable iron, produced by this means, is not quite 12 per cent. of the weight of the ore.

[TO BE CONTINUED.]

On Improvements in Turret Clocks. *By Mr.* W. WYNN.

[From vol. xlv. of the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.]

Dean-street, Soho-square, London, April 17, 1827.

SIR,—As I conceive that the Society of Arts will feel as much pleasure to hear of, as I have to relate, the success of the application of those improvements for which they have honoured me with their rewards, I beg to hand you a rate of going of a church clock which I have lately made and fixed in the splendid old church of Boston, Lincolnshire, in which, among many other improvements, I have introduced the escapement for which they awarded me their gold Isis medal, and twenty guineas, in 1817.

Rate of variation from

1826.—Nov.	16 to Nov.	20,	+17″, being 4 days, at	+6″·75 per day.
	20 to	26,	+35″, being 6 days, at	+5″·83 per day.
	26 to Dec.	2,	+43″½, being 6 days, at	+7″·25 per day.
Dec.	2 to	3,	+ 7″, being 1 day, at	+7″ per day.

During the above series I was with the clock, having other work to execute in the town, and continually had to be opening the case to show the machinery; yet, notwithstanding this frequent disturbance, the daily error of the above rate was only 7″·25—5″·83—1″·42, or less than a second and a half per day. The pendulum has since been altered, to correct the gaining, and the following has since been the rate of the clock:

Rates of variation from

1827.—Jan.	30 to Feb.	3,	— 1″, being 4 days, at	—0″·25 per day.
Feb.	3 to	22,	—13″, being 19 days, at	—0″·614 per day.
	22 to Mar.	5,	+ 2″, being 11 days, at	+0″·18 per day.
Mar.	5 to	22,	+ 1″, being 17 days, at	+0″·06 per day.

In this last series of fifty-one days, the daily error has, therefore, been 0″·684—0″·18—0″·864, or very little more than three quarters of a second.

The accuracy of this rate has prevented the necessity of altering the time of the clock since it was first put going from regulation, and will do so for a long time to come, which is an object of much importance; for an alteration in a public clock, although it be made to correct it, is liable to mislead those persons who are guided by it.

So much is the friction taken off in this piece of work, that the watch part, which goes eight days, whose great wheel is fifteen inches diameter, is keeping up a motion of a two seconds' pendulum, weighing 132 lbs. with maintaining power of 15 lbs. 9 oz. which is not more than a tenth of the weight usually employed in clocks of these dimensions. And I wish to add, that it does not only keep it going, but that it goes well; for the length of the chord of the arc of vibration is twenty-four inches, while that of the angle of escapement is only 9·6 inches. This reduction of the weight of the maintaining power has not only tended to produce the accuracy of rate, but it will be the means of greatly prolonging the duration of the watch part.

I am also much gratified to state that the hammers for which the Society honoured me with another reward of twenty guineas in 1822, most fully answer my expectations. I have attached a set of them to the clock in question, the powers of which are so ample, that they produce sounds from the bells sufficiently loud to be heard in every house in the large town of Boston, which contains twelve thousand inhabitants, an object which was never accomplished before by any eight-day clock. I have also, by the application of my toothed sectors, as described in your 40th volume, and by executing the trains on genuine geometrical principles, been able to lift these hammers with weights from fifty to seventy per cent. lighter than is applied to several specimens of work executed by my contemporaries, as compared with the momenta of the hammers and of the weights severally applied—an object of great importance, as it is generally acknowledged, that to be enabled to lift the hammers of an eight-day clock sufficiently heavy to bring out the tones of the large bells of a church, it would be necessary to employ such heavy weights as to risk the crushing of the machinery in a few years.

I beg to say that the above is a statement of facts which may be most unequivocally authenticated.

I am, sir, &c. &c.

W. Wynn.

A. Aikin, Esq., *Secretary, &c. &c.*

On a machine for opening Horn, for the use of Lanthorn-Makers, Comb-Makers, Cutlers, &c. By Mr. J. James.

Horn is prepared for the use of lanthorn-makers, comb-makers, the cutler, &c. by making it into flat laminæ of various thicknesses,

according to the use for which it is intended. The horns are first cut transversely into pieces, according to the use to which each is applicable. The pieces are then slit longitudinally, and are held separately over a naked fire, till heated to the degree at which horn becomes soft; they are then hammered flat by a mallet, and placed in a strong press till they become cold.

Mr. James, who is himself a worker in horn, objects to softening it over a naked fire, in consequence of its frequently being scorched or frizzled, more especially as in opening the old hard horns it is necessary to allow the flame to enter the hollow, that the inside may be rendered equally soft as the outside.

The apparatus employed by Mr. James is a block of cast iron, with a conical hole quite through it, and a plug of the same metal, about one-eighth of an inch less in diameter than the hole. The block and plug are both to be heated in a common fire, or in a stove, to about the temperature of melting lead; the block is then taken out and placed on a firm support, a piece of horn previously slit is put into the hole, and the heated plug is dropped within the horn. This latter, being heated both from within and from without, soon becomes soft; the plug is then carefully and gradually driven in by a mallet, and by its pressure soon redresses any original crookedness of the horn. After being left for about a minute in this state, the plug is to be driven out by turning the block on one side, and the horn being then withdrawn will be found quite soft enough to be opened and pressed in the usual manner. Considerable saving of time is thus obtained, and all risk of overheating the horn is avoided. [*Ib.*

On the Dams and Sluices of the Saymbrumbacum Tank, near Madras. *By* Francis Buchanan, M. D.

[From a Journey from Madras, through the countries of Mysore, &c.]

In the afternoon of the 23d April, 1800, I set out from Madras, in the very hot dry weather, which usually prevails at this season. After leaving the plain occupied by the houses of the Europeans, I entered a country then scorched up by a powerful sun, yet containing little waste land; for the soil, being fine, produces a very good crop of rice, provided, in the wet seasons, the usual quantity of rain falls. In some places, the industry of the natives causes a verdure that is highly refreshing, by watering a few fields that are near tanks or reservoirs of water. These fields are now covered with rice, approaching to maturity; and in the rainy season they will yield another crop.

Leaving on the right the road to *Poonamalee*, I went to *Condaturu*, near which the country assumes a very different and a very pleasing aspect. Numerous small canals from the *Saymbrumbacum* tank, convey a constant supply of water to most of the neighbouring fields,

and fertilize them without the trouble of machinery. They consequently yield every year two crops of rice. The one at present on the ground will be reaped in June, and has a very promising appearance.

24th April.—I set out early, and soon arrived at *Saymbrumbacum* tank, which is of great extent. It has not been formed by digging, like those in Bengal, but by shutting up, with an artificial bank, an opening between two natural ridges of ground. The sheet of water is said to be seven or eight miles in length, and three in width; and in the dry season is let out in small streams, as wanted for cultivation. In the rainy season it receives a supply of water from the river *Chir-nadi*, and from several small streams that are collected by a canal. As at times the water overflows, and would break down the bank by falling over it, and sapping its foundation, the natives, in different places, construct what they call *codies*, or sluices (weirs) of stone. These are twenty or thirty feet wide, and are lower by some feet than the other parts. On the surface they are strongly fortified by large stones placed in a sloping direction; so that the water rushes over without undermining the bank, and is conveyed away from the fields by a canal. This is a matter of the utmost importance; for there are instances where the banks of these large tanks having given way, whole villages have been destroyed by the torrent. In order, however, that when there is plenty of rain, the tank may be completely filled, a row of stone pillars is placed on the top of the sluices (weirs;) and on the water rising to a level with their base, a temporary wall is formed of mud, sticks, and straw, placed between the pillars, so as to confine the water till it rises as high as the top of the bank. People watch this night and day, in order to break down the temporary bank, should any additional rain endanger the whole. The water is let out to supply the fields, by a sluice lined with cut stone or bricks, formed through the bank, on a level with the country. The inner end of this sluice is covered by a flat stone, in which is cut a conical opening, that can be shut or opened by a conical plug (or valve) affixed to a bamboo staff, and which is secured in its place by passing through holes made in cross guiding-bars, let into two pillars of stone, which rise above the level of the water in the tank. The proper name for a tank of this kind, in the *Tamul* language, is *Eray*. *Saymbrumbacum* tank is said to be sufficient to supply with water the lands of thirty-two villages (should the rains fail) for eighteen months. In these villages, it is said, there are five thousand persons employed in agriculture. In a country liable to famine from want of rain, a reservoir such as this, is of inestimable value.

The late collector, Mr. Place, though he augmented the revenue considerably, yet, by the repairs made on this tank during his administration, he gave great satisfaction to the inhabitants.

On the Manufacture of the Cologne Yellow, as a substitute for the Chromate of Lead. By M. Boutron-Charland.*

The discovery of the chromic acid is one of the finest which chemistry has made during the last thirty years; but the dearness of this product has for a long time limited its use; and, notwithstanding the various manufactories established for its fabrication, it is still of too high a price to be employed in the production of those paints or colours which should unite a facility of laying them on the work, with a solidity of colour.

This new product possesses these two desirable qualities; it is sold in Paris under the name of *poudre de Cologne;* after many essays, it is found that 10 grammes of this substance contain 1,95 of sulphate of lead, 6 of sulphate of lime (gypsum,) and 2,5 of chromate of lead, composed of 1,63 of lead, and 587 of the chromic acid. By the analysis, it could not be ascertained whether this powder was formed by a simple mixture of its component parts, or whether it was a true combination.

After examining this powder with considerable attention, the idea occurred to the author of this article, that the sulphate of lime which it contained in such large proportion, was only impregnated with a small quantity of chromate of lead. In making an experiment, he effected the decomposition of the sulphate of lime and chromate of lead, by a solution of sulphate of soda (Glauber's salt,) and the neutral acetate of lead, and a precipitate was instantly formed of a very fine colour, and which only differed from the yellow powder of Cologne by its lesser density. This difference in the weight induced the author to mix the sulphate of lime, in the state of a very fine powder, with a solution of chromate of potash, and precipitate it by means of the neutral acetate of lead, and he thus formed an exactly similar product. The powder obtained by this last process differed in no respect from the Cologne yellow.

On the Manufacture of Marbles in Germany.†

These well known articles are made in great quantities to serve in the games of children; some are formed of potter's clay, covered with a glaze and burnt in a proper furnace; others are made of marble and alabaster, but chiefly of a species of very hard calcareous stone, found in the neighbourhood of Cobourg, in Saxony. These stones are first broken into square blocks by means of a hammer, and are finally rounded into spheres or small balls by a mill. In

* From the *Jour. de Pharm.* 1827; and re-published in Ferussac's *Bulletin des Sciences Technologiques* for January, 1828. Translated for the Technological Repository.

† From the *Archives des décour. et invent.* 1826; and republished in Ferussac's *Bulletin des Sciences Technologiques*, January, 1828.

order to this, they are placed from one hundred to a hundred and fifty at a time, upon a fixed slab of stone, having a number of concentric circular grooves or furrows made in its flat surface. Above this stone another flat slab or block of oak of the same diameter, is supported by means of a lever, and turned round by the power of the mill. During the rotary action of this mill, small threads of water are made to enter each of the concentric grooves, which favour the rounding and polishing of the balls, and prevent the wood from heating. The operation for each of the quantities above mentioned, lasts for a quarter of an hour, and the balls or marbles become perfectly spherical and fit for sale. Immense quantities of them are exported to India and China. A mill with three turning blocks will manufacture 60,000 marbles a week.

ESSAYS ON LITHOGRAPHY.—No. VIII.

On printing from Drawings or Engravings upon Stone.

When a design has been completed, the stone may be *prepared* for producing impressions, as has already been pointed out, and it may then be coated with gum. It may be immediately used to print with, although many lithographers prefer to let the stone remain in this state for about an hour before using it; the gum is then removed, and the stone moistened by means of a piece of soft linen, or a sponge, squeezed so as not to wet the stone too much: the stone must be so fixed that it may not move by the pressure used. The scraper of the press is so adjusted, as to reach within about half an inch of the design, and to pass backward and forward freely, without going beyond the stone. Its edge should be perfectly straight, tolerably sharp, and very smooth. This, as well as the leather upon which it is to work, should be rubbed with lard, to cause it to work smoothly. The leather should be so fixed upon the frame, that it may not touch the stone on any point, excepting when forced down by the action of the scraper; it is therefore kept one or two tenths of an inch above it. This precaution does not apply to the lever press where the leather is not stretched over a frame. The requisite preparations having been made, the stone is inked by means of the roller, the paper which is to receive the impression is placed upon it, and upon this is laid a sheet of sized paper, which may be repeatedly used, until, from becoming soiled, it must be exchanged; the press may then be used, and the succeeding impressions taken in the same way; moistening the stone between each impression. To manage the inking properly, a portion of printing ink must be thinly spread out upon a stone, and by passing the roller over this at every impression, it is regularly extended, and minutely divided, and the proper quantity for use is taken up. The roller is passed over the stone several times, in order to insure the quantity of ink being deposited upon the drawing which is requisite for a good impression. When the ink is rather thin, as that which is used for drawings done with the pen, or pencil,

for engravings, and imitations of wood-cuts, it is applied very quickly; five or six turns of the roller being ordinarily sufficient; it, however, may require twenty, thirty, or even forty, to give sufficient ink to a very large crayon drawing. It is not unfrequently necessary, before an impression can be taken, to apply the roller anew to the inking stone, and to moisten the lithographic stone a second time with the sponge, as it dries very quickly.

Some persons are in the habit of removing the drawing, either before or after having taken an impression, by rubbing with a sponge, moistened with spirits of turpentine; but it is best not to follow this practice in crayon drawings, until after taking a number of impressions. When every portion of the drawing has been removed by this means, the sponge must be pressed, and the diluted ink with which the stone is covered, carefully cleaned off. The stone is afterwards washed with another sponge and clean water, when the roller must be passed over it, taking care that the moisture left upon the stone, is only sufficient to prevent the ink from taking upon those parts where there is no drawing. If the stone be too wet, the roller will slip, and the drawing would not take the ink well. If properly managed, the lines of the drawing, which has disappeared, will gradually take the ink, and the stone will then be in fine order for giving good impressions. This proceeding furnishes very neat and brilliant impressions, and if it be not followed, the greasy matter which forms the drawing, after it has been subjected to the process of preparation, is apt to be spread and diffused by the pressure, and to produce wide and irregular lines and spots: the removal of the drawing obviates this evil.

When impressions are to be taken from highly finished crayon-drawings, the roller must not be made to pass over the stone with too much rapidity; in this case the ink would not take well, and some parts of the design might be removed. It is necessary to bear upon the roller with a certain degree of force, and to work it cautiously, especially when the stone is inked for the first impressions. When the design is too much charged with ink, or the stone has become blackened, it must be moistened with a sponge, and the roller used more briskly, in order to take off the superfluous ink.

A greater degree of pressure is necessary upon some parts than upon others, and to pass the roller more frequently, according to the effect which certain parts of the drawing may require, or according as the printing ink is more or less thick.

If, in the course of the printing, lines of the drawing become *sticky*, it may be in a certain degree repaired by taking them off with spirits of turpentine; but this is a method which must be sparingly used, as it soon deteriorates the work. After having thus removed the design, it must be well charged with ink and then covered with gum water; and it should be left in that state for twenty-four hours.

Whenever the business of printing from a stone is suspended, it should be covered with gum, that the ink may not become dry and hard. In order to preserve those stones in a good state, which, after the lapse of a certain time, are intended to be used again, they should

be covered, after the last impression is taken, with the *preserving-ink*, (described in vol. 4, p. 267,) and then gummed. Designs might thus be preserved for a great number of years. The preserving ink is to be taken off with spirits of turpentine when it is intended to resume the printing.

Of the corrections to be made upon a stone on which a design has been drawn.

If the stone has not undergone the preparation, it is sufficient to take off the lines or faulty parts lightly with a scraper, and afterwards to make the corrections. The scraper, however, can be used only when the stones are smooth and polished; when they are grained and drawn upon with crayons, it is necessary to regrain the stone, as well as to remove those parts of the design which are incorrect. For this purpose the traces of the crayon may be superficially removed with a sharp instrument, and the grain of the stone sufficiently renewed by picking it, with a sharp pointed instrument; when the drawing may be completed. Should the surface from which it is desired to remove the drawing be considerable, it may be effected by means of pumice-stone, if the stone is to be polished: or if it is to be grained, the part to be corrected may be rubbed with fine sand, by means of a small mullar. This kind of work may be executed even after a number of impressions have been taken from it. The dust which may adhere to the stone, is removed by brushing, and then wiping it with a clean linen, or with spirits of turpentine. The design is now to be renewed, and, when completed, the part should be washed over with diluted acid, by means of a pencil, and then covered with gum-water; after having allowed the stone to remain in this state for a few hours, new impressions may be taken. Spirit of turpentine may also be used, to remove the defective parts of a design which has not yet been printed from. When any part of the design disappears in the printing, it may be restored, either with ink or with the crayon, the stone having been first well cleaned from the gum; before recommencing the printing, it is to be prepared and gummed as usual.

If, after having prepared and printed from a stone with a drawing in the manner of engraving on wood, or with large masses of black and white, it is observed that dark or light spots appear, which it is necessary to destroy, the stone, which has been prepared with aqua fortis, must be scratched, in order that the ink with which it is to be covered, may adhere to it perfectly.

It sometimes happens that the printing ink adheres to some parts of the design, or thickens the lines and forms little soft portions; and it is necessary, in this case, to apply an immediate remedy. Those defective parts are taken off by rubbing, and then washing the stone with a sponge, or with the finger and a little gum-water. When those blotches have disappeared, a pencil charged with very dilute aqua fortis should be passed over the parts; they are then to be again washed with the gum, and the printing resumed; it is best, however,

to suspend this operation for several hours, in order that the gum may have time to penetrate the stone.

When a drawing is well transferred, no trace whatever will remain on the autographic paper; if, however, all the parts of a writing or design have not adhered sufficiently to the stone, the defective parts may be supplied or corrected with a pencil or a pen, before the stone is prepared. If the stone has been *prepared*, it must be scraped with a suitable instrument, or polished with pumice-stone; then prepared, gummed, &c.

It is desirable to avoid, as much as possible, all necessity for corrections of every kind; and this may, in general, be done if sufficient care be taken in every part of the work, and in the printing. It is, however, very important to be able to remedy defects with facility, in order to obtain a greater number of good impressions, from the same design. This is the most difficult part of the art, and requires new improvements.

We might have entered into further details upon the subject of lithography, and have spoken of some other modes adopted in the practice of it, had our object been to give a complete treatise upon this art, and if the extent of our paper had permitted us to do so. But the end we had in view, and which we hope we have attained, was to impart some knowledge of the art to those who were ignorant of it, or to render assistance to such as wish to practice, or to attain greater proficiency therein. It is of vast importance that a process so useful, not only to the arts and sciences, but also to social intercourse, and in the progress of knowledge and civilization, should be rapidly brought to that perfection of which it is susceptible.

Whenever this is accomplished, the monopoly of the lithographic art, attempted by all the governments in Europe, excepting that of England, together with the censorship of the press, will be abolished. It is to be hoped that the day is not far distant, when every individual will be able to express his thoughts by means of a lithographic press, as freely as he now can by the aid of a little ink and paper.

N. B. Some of our patrons have asked for information with respect to the presses for printing lithographically from prepared paper, or metallic plates, which for some years have been offered to the public for sale. We cannot recommend this method, which has hitherto proved very defective, but which, nevertheless, deserves the attention of inventors. It would be a great triumph for autography if we could substitute metallic plates for stones, which, until the present time, have alone been successfully used. We hope to be able to make some improvements in the lever press, of which we have given a description in this Journal, and shall gladly hasten to make them known, should a favourable opportunity of doing so present itself.

Remarks by the Editor.—It appears that the regular series of essays in the *Journal des Connoissances Usuelles*, are here brought to a close. The article giving an account of the lever press, above

mentioned, we will hereafter insert. The subject of lithography will be occasionally continued by the Editor, who has in his possession the best practical treatises on the art which have appeared in the French language, and which he has imported specially with this view.

On the Causes of Dry Rot in Public and Private Ships, and its Remedy. By JAS. BARRON, ESQ., *of the United States Navy.*

A PAMPHLET under the above title has just been published in Norfolk, by commodore Barron. The subject has been repeatedly noticed in this journal, and from the great increase and extent of the evil proposed to be remedied, demands the utmost attention. We shall make a brief abstract of the former, and give to our readers the whole of the latter part of the pamphlet.

The dry rot is attributed to the influence of foul air extricated from the bilge water; and the remedy proposed is the free supply of wholesome air, by constructing the vessels in such a way that it may have free access to the timbers. The deleterious effect of foul air upon vegetable bodies, is viewed as analogous to its action upon animals.

"The most positive proofs (says the commodore) of the destruction occasioned to timber by a foul atmosphere, are to be seen in every ship that is found in a decayed state; the best timber connected with the interior, being more or less injured, while that, even of an inferior quality, situated on the exterior, will be found to be comparatively sound.* A particular illustration of this truth is seen also in the excellent preservation in which the cabin furniture and joiners' work of ships, such as birth boards, &c. are found, arising from the free ventilation of those apartments, and their remoteness from the source of the noxious air generated by the bilge water. I would not be understood as ascribing this destructive agency directly to the bilge water itself, for it is well known that those parts of the timbers which are always covered with it, are seldom known to decay, while those immediately above it are most injuriously affected by the noxious air arising from it."

"Every ship or vessel acts, in some degree, as an hydraulic bellows, according to the quantity of water allowed to remain in her after the pumps have sucked; for as this water, by the motion of the vessel, rolls from side to side, the air above it, is by its motion, alternately forced out and drawn in between the timbers."

"It may not be irrelevant here to observe, that the tightness of ships is a fruitful cause of the destructive atmosphere of which I am

* "Eight years after the frigate United States was launched, I visited her, and found all the materials unconnected with the internal air, (that is, that air between the inside and outside plank) as perfectly sound as they were when I first joined her in '98: I served on board of her for two years, and could readily identify the articles alluded to. At the time I speak of, the United States had undergone one thorough repair and was equally ready for the second."

speaking; for there is not an instance of the sudden decay of a ship that has proved leaky the first three or four years of her running; and this can only be accounted for, by the continual use of her pumps, constantly admitting a quantity of pure water, and again removing it before it can become impregnated with the properties of the wood and the metallic substances, from which it derives its destructive qualities."

The ventilation is proposed to be accomplished by bellows constructed like the common smith's bellows, and to be worked by hand; all modes arising from the motion of the vessel having been found altogether uncertain. A pipe leads down from the valve on the under side of the bellows, and is, at the bottom, connected with another pipe passing fore and aft the vessel, and opening by means of short pipes into the spaces between the timbers, these short pipes being made to pass through the limber boards for that purpose.

The commodore has found that the odour from a small quantity of any suitable substance deposited in the hold, may in a few seconds be perceived upon the deck, when the bellows are worked.

Of the Building of Ships.—"In the preceding pages I have intimated, that in order to the beneficial operation of the air-pumps or bellows, and to prevent the secretion of the destructive air, which the machine is intended to extract, ships should undergo a considerable change in their construction.

"I have submitted my ideas on this subject to several of our most celebrated mechanics, all of whom concur with me in the opinion, that a change may be made in the manner of constructing our ships, without the least risk of impairing their strength; for, although there will be a much smaller quantity of materials employed than in those heretofore built, yet, from the combination of these materials, the ships will be stronger than when, as now, loaded with metals and timbers, which rot in a few years. This superabundance of metal and timber occasions ships to swim too deep, and in a great measure destroys the invaluable quality of buoyancy; while the unnecessary precaution of close ceiling ships, with a view of giving to them additional strength, is, I again urge, one of the principal causes of their rapid decay.*

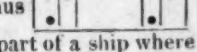
"A very important advantage would accrue to the merchant service, from the proposed change in the construction of ships, whereby a free ventilation would be afforded to the *cargoes*, which, especially when in bulk, or composed of articles making close stowage, are liable to great damage from being over-heated. This evil is almost inseparable from a *tight* ship, which, as before observed, generates a foul air, destructive to every thing that comes in contact with it; and it has been distinctly ascertained, that less injury would be done to cargoes of grain, and other articles stowed in bulk, in leaky than in

* "In the year 1805, Col. Lear informed me that he visited the frigate *Crescent* in Algiers—she was then about seven years old, and built of the common oak of New England. On examining her, he found that her ceiling had been taken out; and the minister of marine informed him, that to this cause they attributed the duration of their ships."

tight ships; the latter not being so susceptible of ventilation. A great benefit would also result to the *crews*, from the better state of preservation in which the *provisions* of ships would be kept, by this improvement in their ventilation.

"Formerly, when ships were built in Virginia, (for the merchant service,) of the common oak of the country, and not so closely connected in their timbers or ceiling as at present, it was not uncommon to see them from sixteen to twenty years old before they had undergone any material repair; but lamentable to relate, we now seldom see a ship, either public or private, that is not more or less rotten in from five to seven years after she is built. The question may then reasonably be asked, what nation can support a navy, if its ships are to be rebuilt in so short a time after their construction?

"Again, if the quantity of timber used in the construction of ships, both public and private, is, under any circumstances, necessary, how are we to account for the latter performing long voyages, through tempestuous oceans, loaded with heavy cargoes, without complaining either by straining or leaking; when, on examination, they are found to be so rotten as scarcely to exhibit one entire sound plank or timber; and, but for the superior quality of the live oak, of which our national ships are principally framed, they would be in the same situation? The fact above stated, of the competency of our private ships to sustain the strain of heavy cargoes, even in the decayed condition represented, certainly goes to prove, that more timber is employed in the construction of our public ships than is necessary for the purposes of strength alone; and regard to the valuable quality of buoyancy, should furnish a strong reason for not lumbering them with superfluous materials. It is an incontrovertible fact, that merchant ships have encountered the heaviest gales while in the condition above stated, without exhibiting the slightest sign of weakness. Public ships, when so loaded with timber, float too deep in the water, either for comfort or fast sailing. The practice too of ceiling the decks over head, for ornament sake, is also ruinous to the beams and deck plank itself, while it so much increases the weight in timber, of which I complain.

"All national vessels should be built with copper bolts, wherever they can be introduced, to be secured by *screw* taps on their inner ends, and removed or replaced at pleasure when a ship is repaired; and by no means should the present practice of cutting out plank and breaking off bolts be allowed; being a great waste of time, and often of valuable materials. If ships were built in the manner here recommended, the strakes of plank might be removed or replaced with convenience, without an additional hole being bored in the frame. It might probably become necessary, in this case, to use bolts one size larger in repairing, as driving out the bolts might somewhat enlarge the hole. I should recommend one bolt in each edge of the plank to pass through each timber composing the frame thus  and not to use tree-nails or spikes at all, in any part of a ship where they can be dispensed with. Thus constructed, ships can be com-

pletely ventilated, and when they require repairs, they may be taken asunder with perfect ease, and in a manner to expose every part of their frame to view, by which plan no defect can be concealed or rendered difficult to remove.

"Again, ships should be built in regular frames, coaged or dowelled together, and strongly bolted from the floors to the top timbers.—These frames should be placed from eight to twelve inches apart, (according to the size of the ship:) the ceiling, as far up from the keelson, as one or two strakes above the floor heads, may be flush, and then chamfered pieces, (a term used by carpenters for horizontal pieces of plank) perforated with many small, smooth holes, let in between the timbers—covering the openings between the ceiling and outside plank, to admit the fresh air, as fast as the foul is pumped out by ventilators: the ceiling should then be partial up to the strake below the clamps of the lower gun-deck; using only three strakes of ceiling of from eight to twelve inches wide (according to the size of the ship) over each joining of the timbers. The ceiling should be of plank one-third thicker than that commonly used, and the frame let into it fully that third, thereby forming a kind of jog and chock work, on the principle of a square, supported from the point of each angle thus which renders the whole frame more secure than a general ceiling in the manner now practised. On each gun deck a strake, or a small part of one, should be left out, and the openings furnished with shutters, hung by hinges, or metal slides, opposite each aperture between the frames, for the purpose of ventilation; to be closed in time of action, or during violent weather. On this plan it is evident ships would be much lighter, contain less timber and other costly materials; would also be sufficiently strong, and show at the first glance that they must be more healthy, as there would be scarcely a place in them where foul air could be secreted.

Of store rooms, &c.—"The whole system of bulk-heads and partitions for store rooms might also be changed for a more open and airy arrangement, all tending to remedy the evil complained of, by admitting a free and unobstructed current of air into every department of the ship, alike promotive of the health of the crews, the preservation of the ships, and of the valuable materials in charge of the store-keepers. Stanchions and shelves would answer all the purpose of dividing the different articles, and one *general store-keeper*, better qualified than those to whom such service has heretofore been assigned, would suffice to supervise the whole distribution of the stores.

On the magazines of ships.—"The magazine of every ship should be as distinct from the hull as convenience will permit. It should form a box, supported on all sides by stanchions, and made perfectly tight, so that in case of fire, it might be overflowed by water, introduced by a pipe passing through the sides of the ship into the box, without connexion with any other part of the ship's hold. An excellent idea has lately been suggested, for guarding against accidents, in conveying powder on board of ships, as well as against

the awfully destructive effects of an explosion in the magazine. The plan is this; to have canisters of copper, with screw tops, made water tight, capable of containing from sixteen to twenty rounds of cartridges. Under such circumstances, should a fire occur on board, the magazine might be immediately filled with water, without detriment to the powder; and the ship might burn to the water's edge and fill, before an explosion would be likely to take place. Another highly important advantage of this plan, is the increased effect given to the exertions of the crew, by removing all apprehension of her blowing up; the alarm from which, has on several occasions proved destructive to that discipline, which otherwise might have been effectual in saving the ship.

Of the pumps of ships.—"I cannot but look back with astonishment at the listlessness that has prevailed in the nautical world, for such a length of time, in allowing so great a quantity of water to remain in a ship, after the pumps have sucked. This water, commonly called bilge water, is also a principal cause of a ship's decay, and of the unhealthiness of the crews; notwithstanding which, it is yet the custom to allow, from six inches to two feet of this poisonous water to remain in a ship, under the idea that it would be dangerous to let the pumps have a closer connexion with the seams of the garboard strake, lest they should draw out the oakum from those seams so nearly connected with them. The best reason that could be assigned for not allowing the pumps to descend lower, or to the outer plank of the bottom, commonly called the skin, is that ships are now built much stronger than heretofore, and of course, from the close connexion of the floor timbers, there is not room for the pumps to enter between them; consequently the depth of the floor timbers determines the quantity of bilge water, allowed to remain in a ship. This inconvenience might be removed by having one or more *small* pumps placed farther aft, and let so close down to the inner part of the outward skin, as to take this water up within an inch of the bottom. I will suppose that the close connexion of the floor timbers—or a better reason than the one assigned, namely, that when further removed from any obstruction, the water naturally flows more freely to their heels or entrance—has been the cause of the pumps not being let down nearer to the bottom of a ship. But this reason can have no manner of influence, nor be properly urged as an objection to allowing one or two small pumps to go down within one inch of the bottom, only to be used in drawing this fetid water entirely out of the ship, after those placed at a greater distance from the bottom have sucked, and thereby to extract the last drop of this poisonous cause of death and destruction."

Ships on the stocks, under cover—"One simple suggestion for their better preservation, may not be ill-timed.

"The admission of the external atmosphere in its mildest stages, is, as before intimated, as advantageous to the preservation of timber, as it is generally found to be to that of the human system. Timber of the most superior quality, and in fact every species and quality of wood, exposed to unrestrained currents of the atmosphere, will be

rent and split to pieces by the alternate expansion and contraction, thereby occasioned. The proofs of this, are numerous and of daily recurrence. I would therefore recommend that all ships under cover, should be sheltered from the effects of changes in the atmosphere, by causing all the apertures in the ship houses to be as carefully closed as if occupied by families; and opened only when the air is pure and salubrious—for it is an undeniable truth, that timber, exposed to unrestrained currents of the atmosphere, and the vicissitudes of the weather, is rapidly rendered unfit for any useful purpose. Our household furniture affords conclusive evidence of this result; for however perishable its materials, it is seldom seen to be decayed or rent.

"If the foul air in the first instance, and an unrestrained current in the second, are not respectively the causes of the rapid destruction of timber, to what cause is it ascribable, that every species of wood, even of the most inferior kind, is found in a good state of preservation when totally excluded from the influence of either of these destructive agents?"

Observations and Inquiries respecting the alleged Decay of American Timber, in England and Ireland.

The subject to which the subjoined extract of a letter refers, is one of great curiosity, and of deep interest. The letter is from a person of the highest standing for talents and integrity; one whose name alone would bespeak attention to the inquiries made, apart from the importance of the trade dependant upon the productions of our forests.

The Editor had previously heard statements made respecting the rapid decay of certain kinds of American timber, which had been used for architectural purposes in England; these statements he had always considered as greatly exaggerated, if not altogether false; and he viewed, and still views this opinion as justified by the well known fact, that at home, our pine, and other woods, are as durable as the deals from Norway, and the other species of timber imported into England from the north of Europe. The alarming manner in which that species of decay denominated the dry rot appears to have increased in our own day, it was believed would aid in accounting for the complaints alluded to, although the timber of our own, might not be more susceptible of this disease, than that of other countries. We have inquired from gentlemen who have resided in Canada, respecting the durability of the timber of that section of our continent, but have not heard of any fact to lead to the conclusion that their woods used in building, decay more rapidly than those employed by us. Every builder in Philadelphia, we are assured, has seen girders, joists, rafters, and other timber taken from houses which have been pulled down, after standing for nearly a century, which he would prefer to new wood from the mill, because it appeared equally sound,

and was perfectly seasoned. The sap (alburnum) of the red deal, of Europe, and of the yellow pine of our country, is, we know, equally subject to the ravages of insects, when cut down at an improper season, and suffered to lie in the woods with the bark on, until they have made a lodgment in the timber.

Should the fact stated below be eventually authenticated, we shall conclude that the English have an insect which has an unfortunate fondness for American food; we hope, however, and believe, that the accounts given will be found to be incorrect; the truth must eventually be ascertained, and the earlier the better; we earnestly desire those who may possess any accurate information upon the subject to communicate it for publication. Is there any insect known which will perforate cork?

Extract of a letter from a distinguished individual in Ireland, dated February, 27, 1828.

"I have lately heard a curious fact respecting some American timber; I believe Canadian pine, but of this I am not certain, as the words used by the person who told me the anecdote were general, viz. American timber.

"A person of our acquaintance had 36 dozen of wine in bottles, packed in Dublin in sawdust of American timber. The sawdust, when the wine was unpacked, was found swarming with an insect which had eaten through the corks of several of the bottles—the wine was spilled, and the bottles filled with the insects; all those of which the corks were yet safe, the person was obliged to have new-bottled. I mentioned this fact to Mr. ———, a great Dublin coach-maker, to whom I had occasion to write at the time, and to whom I thought it might be useful—he answered in these words.

"'I had heard before of the insect you refer to in the sawdust of American timber, and in the timber itself there is a much greater grievance. I understand there are whole streets in London lately built, in which this timber has been used, and rendered almost unfit for habitation by the *cimax* (I believe) *axanthia*, which actually swarms in the crevices of the joints, &c. and cannot be removed by any thing short of conflagration.'"

"I wish you would let me know if there be any complaint of any particular kind of timber in America as being infested with this insect. If the fact be as stated, the *kind of timber* should be distinctly described, for avoidance, else the general report will affect the credit of all American timber. Is there no remedy? Pray inquire, and make your answers more distinct than I have made my questions." E.

AMERICAN PATENTS.

The last number of this journal announced the appointment of the Editor as Superintendent of the Patent Office of the United States. His future residence will, consequently, be the city of Washington. The claims of his official duties, added to the task of a removal, will for a time, interfere with the selections from American patents, which will hereafter occupy many of his pages. He hardly dares to hope that the effect of the plan which he has marked out, will be very apparent until after the lapse of two months. Those first chosen, will, in consequence, be such as will not need the aid of the engraver, but graphic illustrations of the mechanical genius of our countrymen, will, hereafter, be freely given.

'The Repertory of Patent Inventions;' 'The London Journal of Arts and Sciences,' and 'The Register of Arts and Patent Inventions,' published in London, are principally devoted to the patents of Great Britain, whilst the more numerous patented inventions of this country, have remained almost unknown.

When the Franklin Journal was first established, it was intended, among other objects, as may be seen by the prospectus in the first number, to embrace the patents of our own country, and several of them have been published accordingly; but the difficulty of making a proper selection, whilst the Editor resided in Philadelphia, was such as to preclude their frequent appearance; his present station is in this particular most eligible, and his determination is to turn this circumstance to good account. The list of American patents will hereafter appear regularly, so as to embrace, in each number, those obtained in the course of a month.

Description of the mode of heating rooms, invented by Archibald M'Alister *&* John Iggett, *of Ross county, Ohio.* Patented Dec. 15th, 1827.

We the subscribers, do hereby declare that our improvement in the art of warming and heating the various rooms and apartments of houses, is of the character described in the following words, that is to say: A cast or sheet iron stove, of any required size or dimensions, is to be enclosed on the sides, ends, top, and bottom, with marble slabs, either polished or in the rough, or with brick, or other kinds of stone. This covering may be in thickness, from one to any number of inches, though it is believed, that a thickness, of from one to three inches, will best answer the ends for which it is designed; it is not to be in contact with, but at a distance from the stove, of from one to any number of inches, though it is believed, that a distance of from one to three inches will accomplish best the object in view. The several plates on the side, ends, top, and bottom, are to be so made and fitted together, as entirely to enclose the stove, with the exception of the spaces hereinafter mentioned to be left, viz:—The plates

around the sides and ends, are not to extend upwards so far as to be in contact with that over the top of the stove, but a space is to be left between the same, of from one to three inches wide, entirely around the stove, and the top plate to rest on marble, brick, or other stone blocks or pillars, standing on the side and end plates—a space is also to be left on the top of the stove, for the pipe to pass through. If the door be in the end of the stove, a space should be left accordingly, in the front plate. The plate in front may be left off entirely, and in that case, the ends of the upper, and under side plates of the stove, are to be connected, by means of marble, stone, brick, or any other durable material, occupying the intermediate spaces; a tube of tin or sheet iron, communicating with the air outside of the house, or at least with that out of the room in which the stove stands, is to pass up through the floor, and through the lower plate of the covering above described. Thus constantly supplying the space between the stove and the casement surrounding it, with fresh air, which, as it strikes the stove and becomes heated, passes in a continual current, through the space left, as above mentioned, around the upper edge of the stove, out into the room where the stove stands. The foundation upon which the stove is to stand, and the pipe accompanying it, may be the same as those of stoves now in use. Instead of leaving a space as above described, between the upper plate and those around the sides, said plates may be made to come in contact with each other, and in that case, a number of holes are to be made, through the upper plate, for the air to pass through; and the upper plates may, if wished, be cast iron, and side holes left in them, at the time they are cast.

For the purpose of burning the Lehigh or other coal, which is difficult of ignition, the stove may be of such a shape, that a lateral or horizontal section of it, may be either circular, square, or oblong, with the door or aperture through which the coal is to be put into the stove, on the upper part of one of the sides or end plates: For the purpose of giving a draft to it, a number of small holes are to be left through the lower edge or corner of the same, and a few also, through the bottom of the stove, through which the air is to pass from without, into the stove. The stove is then to be encased, on all sides, in the manner above described, with marble, brick, or other stone, leaving a space as above mentioned, for the heated air to pass out into the room. A tube, like the one above described, is to accompany it, for the purpose of forcing the air out into the room; and for the purpose of giving an additional draft to the stove, another tube or tubes similar to the first, is to pass up through, and communicate the air to the above mentioned holes, around the lower edge and bottom plate of the stove. The pipe may be placed upon it as with stoves now in use; or if a greater draft is wished, the pipe may pass down into the stove, so that its lower extremity shall reach near to the coal in the stove, and in the latter case, the portion of the pipe passing into the stove, must be of cast iron. To catch the cinders and ashes, falling through the holes in the bottom of this kind of stove, a space is to be left at the bottom of one of the ends or side

plates, of two or three inches wide, into which, a sheet iron draw is to be inserted, of dimensions fitted to fill said space.

The principal advantages of stoves thus improved, over all others now in use, are the greatly diminished quantity of fuel which they require, their increased power of throwing out heat, and the greater uniformity of temperature which they produce in the air of the room where they stand. The improvement consists in the application of the above described tubes and casements, to the ordinary stoves now in use, and the principles therefore, which distinguish this improvement, may be applied to stoves of any kind, shape, or dimensions.

Stoves thus constructed, combine, it is believed, all the important advantages of the Russian, and other stoves now in use, with those which peculiarly distinguish the above described improvement superadded to them.

ARCHIBALD M'ALISTER,
JOHN IGGETT.

Specification of two Patents issued to WILLIAM MAGAW, *of Meadville, Pennsylvania, for making Paper of Straw, &c.—the first dated March 8th—the second 22nd May,* 1828.

TAKE any quantity of straw, and boil it in water with salts of ley, pot or pearl ash, in the following proportions. To one hundred and fifteen pounds of straw, add from fifteen to twenty pounds of the salts of ley, and boil it about thirty minutes, then draw off the water, and put the straw into a common paper engine, to be manufactured like rags into paper. WILLIAM MAGAW.

The improvement or discovery consists in preparing straw, hay, or other vegetable substances for the manufacturer of paper in the following manner. Take any quantity of straw, hay, or other vegetable substances, and boil it in a solution of salts of ley, pot, or pearl ash, or other alkali, or lime, in the following proportions, viz. To one hundred and fifteen pounds of straw, hay, or other vegetable substance, add from fifteen to twenty pounds of salts of ley, pot, or pearl ash, or other alkali, or lime, and boil them about thirty minutes, or steep the materials in the solution a few days, or until saturated: then draw off the water, and put them into a common engine, to be manufactured into paper like rags.

The discoverer claims as his exclusive improvement or discovery, the materials, and the mode of preparing the straw, hay, or other vegetable substances, so as to render them fit for the manufacture of paper. WILLIAM MAGAW.

By turning to p. 92, vol. 1, the reader will find that Louis Lambert, of Paris, obtained a patent in England for a process similar to the foregoing, in which it is expressly stated that "the straw is then

boiled with quick lime in water, for the purpose of extracting the colouring matter, and separating its fibres. Castic potash, soda, or ammonia may be employed for this purpose instead of lime."

Specification of the mode of extracting Tannin from Bark. Patented by Joseph Giles, *of Guildford, Vermont.* April 11, 1827.

Specification.—This lixivium, or tanning principle, is obtained by soaking and digesting the proper materials, such as fine ground oak, or hemlock bark, &c. in an apparatus designed particularly for the purpose: that is to say, I take twelve leaches or vats, of any convenient capacity, each filled with ground bark, and so placed, as to draw by a cock, with suitable convenience, from each of the twelve leaches into one common receiver; I then place one cistern above the leaches, so as to draw from said cistern, into all the twelve leaches. Into this said upper cistern, I have a common engine for generating steam, operating so as to heat the liquor therein, to a boiling heat; which liquor, thus heated, I draw upon and fill the first of the said twelve leaches. I take care in filling the leaches with ground bark, that it be loose and be not crowded; but so that the liquor will freely fill the whole leach, and become saturated with the tanning principle of the bark; after thus lying upon the bark, and soaking it a convenient time, I draw it from the leach into the receiver; I then pump it from the receiver, back in the cistern, and heat it again with the steam engine, as before; then I draw the liquor upon the second leach, and while it is soaking there, I heat water, or weak liquor, drawn from the leach, after the first process, and draw the same from the cistern upon the first leach; I then draw the strong liquor from the second leach, into the receiver, and from thence, pump it again, into the cistern; I again heat it as before, and then draw it upon the third leach, and so continue the liquor—repeating the process through the whole twelve leaches, following on with the second, and third, and sometimes fourth addition, to the first leach—taking care that none of the weak liquor or subsequent runnings become mixed with the first running and strong lixivium. As often as the tanning principle becomes entirely exhausted from the leach in any of the leaches, throw away the leach, and fill with fresh. By continuing this process, I reduce the entire tanning principle and strength of three, and even four cords of the best bark, into one hogshead of tanning lixivium. I then add two pounds of saltpetre, and one pound of common salt, to each hogshead of my lixivium, and bung it up, air-tight, for use.

One hogshead of this lixivium will, in three days time, sufficiently tan five dozen of calf-skins, and heavy skins and hides, in the same proportion. In addition to the great saving of time, and labour of workmen, produced by the use of this powerful lixivium, the leather will be more completely tanned, will weigh heavier, will be more

sólid and close, and be less subject to be soaked with water, and grow spongy, than leather tanned in the ordinary manner.

This lixivium, may also be usefully applied to cables, to all sorts of ropes, sails, canvass, and the tackle of ships, made from hemp, or flax: charged and impregnated with this principle, they will support a greater weight, obtain a greater strength, will wear longer and smoother than the common tanned rope or cable. It may be transported to all parts of the United States in a perfect state of preservation, and be at all times ready for use, either for tanning, or other purposes, and thus, supersede the use of bark in the ordinary way.

JOSEPH GILES.

Specification of an improved mode of impressing figures on the rollers for calico printers, by etching; invented by DAVID H. MASON *and* MATTHIAS W. BALDWIN, *of Philadelphia.*

THE former method of making these mills was by punches, with figures of rosets, leaves, circles, pins, or other figures. The punches having on them the figure or device required, are driven into the steel cylinders or mill, and the metal raised up by the punch is faced off, and the parts united and trimmed with a graver; or the whole figure or device was cut in with a graver.

The improvement of the petitioners consists in *etching* the device on the mill, which we do in the following manner: A steel cylinder or mill is prepared, of suitable size, with pivots or journals, in the usual manner of making such mills; the mill is then coated with varnish, or etching ground, such as is used by engravers for covering their plates, in etching; the device is then traced through the varnish or etching ground, with an etching needle, or steel point: the device being thus traced, the pivots or journals are coated with a varnish made with asphaltum and spirits of turpentine, so as to prevent the acid from acting on the mill except where the device has been marked through the varnish with the etching needle, or steel point; the mill is then immersed in a prepared acid, in making which, we use the same kind of acid (viz. aqua fortis, or nitrous acid,) which is used for etching on copper; but are careful not to have any copper in it. Our mode of preparing the acid is as follows: we dilute the acid in the proportion of four or five of spring water, to one of acid, and then dissolve in it as much tinfoil, or block tin, as it will take up, or until it ceases to effervesce; while in this operation, it must be in a bottle with the stopper out: this mixture is diluted in the proportion of from eight to fifteen parts of water, to one of the acid used in the first instance, according to the kind of work to be etched. For coarse work, the prepared acid should be strong; and for delicate work, it should be weak. This prepared acid is managed, in all respects, as nitrous acid is managed, by engravers on copper, except that generally, in the prepared acid, there are no bubbles by its action on the steel.

This process may be performed by any of the other preparations

of acid used in biting soft steel; but that above described we found to answer best.

When the mill or steel cylinder, has been in the prepared acid a sufficient length of time, to bite in the figure, or device traced with the etching needle or steel point, to the required depth, (which is ascertained in the usual way, by scraping off the varnish from a part of the device,) it is taken out, the coating of varnish removed, and the figure, or device, is finished with a graver, in the usual manner of finishing etching; the mill is then hardened, and a transfer taken from it to another steel cylinder or mill, so that the figure, or device etched, in the first, shall be raised on the second; in order that it may be impressed on the copper cylinder, to be used in the calico printing; all which transfers are made in the usual manner, and with the usual machinery for affecting such transfers of engravings.

What we claim as our invention, or improvement, is the *etching* of figures, or devices, on steel cylinders or mills, to be transferred to copper rollers for calico printing. We claim nothing more.

In testimony that the above and foregoing is a true specification of our said improvement, as herein before described, we have hereto set our hands and seals, this twelfth day of October, in the year of our Lord eighteen hundred and twenty-seven.

DAVID H. MASON.
MATTHEW W. BALDWIN.

Specification or Description of an improved Gun Lock, for which a patent has been obtained by NATHANIEL SALTONSTALL, JR., *of New London, Conn., prefaced by a few remarks on the defects of those now in use.* Issued May, 1828.

VERY many of the dangers to which we are exposed from the accidental discharge of fire-arms, arises from the present imperfect construction of the lock, the trigger of which, is at all times immediately connected with the dog, and may in many cases be made to trip when only half-cocked, and has been attended with the most fatal consequences to sportsmen, horses, horsemen, soldiers, and private individuals, by the accidental catching of the trigger, the sudden jar of a holster, the pressure of a heavy finger, or the trifling of the inexperienced, when little care was supposed necessary; and with most of our locks the dog must be drawn from the tumbler so suddenly, to prevent their catching at half-cock, as to destroy the aim.

The following description of my improvement, I think, will supply these defects, and combine entire safety with durability and simplicity. When the lock is only half-cocked, the tumbler is secured by a strong steel dog, hung nearly perpendicular from the top of the plate, its screw supported on top by a bridle or cap; on the right hand side of this dog, and falling nearly perpendicular with its centre, is a tooth or wedge, with its point downwards; on a line with the bottom of this tooth or wedge is a lever, which has on the end next the

tumbler a tooth or wedge, similar to the one on dog, and an arm projecting on its outside at right angles with the plate; this lever may be of a suitable length, accommodating itself to the size of the lock, and is secured by a screw on its opposite end; between this lever and dog, and operating near the heels of each, lays a double acting spring, forcing the dog into the tumbler, and the lever from the dog; the lever is prevented from falling below the plate by a projection or stop. If the lever is now raised by the trigger, the tooth or wedge passes on the right hand side of the one on dog, and by the combined action of the teeth or wedges, and spring, which is now put in its greatest tension, the lock is more firmly secured together; if the lever is kept raised by the trigger the tumbler is secured, and the cock cannot be moved backward or forward by any external application; the moment the finger releases the trigger the lever returns to its place, and admits of cocking the lock. The upper part of the tumbler is more full than the lower, and the upper notch not so deep as the lower one, consequently, when cocked, the tooth or wedge on dog passes on the right hand side of the corresponding one on lever; if the lever is now raised, its tooth or wedge passes on the left hand side of the corresponding one on dog, and draws it from the tumbler without the possibility of its catching at half-cock, unless eased to its place by the hand. As this description refers to a right hand lock, an inversion of its parts would form one for a left hand barrel. This improvement is not understood to be confined to the situation I have given it in my drawing, but may be applied in various situations round the tumbler, and at convenient distances, and in forms and sizes suiting the fancy; and its effects produced with equal certainty by dropping the lever, if thought more desirable, which may be accomplished by a different disposition of its parts. With this improvement, which is easily applied to old locks by a slight alteration of their tumblers, and removing their dogs and feather springs, or dog springs, and is alike applicable to all gun locks operating by flint and steel or percussion, effectually securing them from springing when only half cocked, and insuring a perfect stroke with the cock when firing, is designed without bruising the dog or tumbler notches.

I claim every mode of operation for engaging and disengaging the trigger from the dog, securing the dog with, and disengaging it from the tumbler, on the principle of inverse application of lever or levers, inclined plane or inclined planes, cone or cones; half circle, or half circles; tooth, or teeth, of any curvature; applied by an arm or lever, as in my drawing, or on the principles of a bolt, or slide, which produces the same results, and may be varied to suit the fancy.

Nathaniel Saltonstall, Jr.

An improvement in the Process of making warm pressed Castor Oil from Castor Beans, invented or discovered by TIMOTHY PHARO, *of Tuckerton, New Jersey.*

Specification.—A kiln built of bricks, about five by six feet square, and four feet six inches high, is to be erected, and to be covered with tin or sheet iron, supported by small iron bars across the top. A wooden frame, from four to six inches deep, is placed on the edges of the top of the kiln, to confine the beans on the tin floor, while warming. A large sized iron stove is to be enclosed in the kiln, with the stove door on a line with one end of the kiln, for the purpose of keeping up the fire, to raise the proper heat. At the opposite end of the kiln, a small iron door is hung, for the purpose of opening and shutting occasionally, to graduate the heat.

When preparing to press the oil from the beans, the beans are to be placed upon the tin or sheet iron floor above described, where, by means of the heat raised by the fire kept up in the stove, the beans are warmed to any degree the manufacturer deems proper, and are thence removed into the iron churn to be pressed with an iron screw, propelled by horse, steam, or water power.

The above described process of procuring the oil from the beans, is new and to be preferred; because,

1st. The beans are more expeditiously warmed, and saves the expense of the labour of one hand.

2nd. All danger of scorching them is avoided, and thereby the oil is saved from any disagreeable taste, and procured in the utmost purity.

3d. The beans can be properly warmed and dried for pressing, even when in a damp state, which cannot be done by a cylinder.

TIMOTHY PHARO.

ENGLISH PATENTS.

List of Patents for New Inventions, which passed the Great Seal in England, in January, 1828.

To William Gossage, chemist; for his having invented, or found out, certain improvements in the construction of cocks, for the passage of fluids—Sealed, January 2.

To Thomas Botfield, coal and iron master; for his invention of certain improvements in making iron, or in the method or methods of smelting and making of iron—January 2.

To James Hall, junr., dyer; for his invention of certain improvements in dying piece goods by machinery—January 2.

To Joseph Clisild Daniell, clothier; for his invention of certain improvements in dressing cloths, and in the machinery applicable for that purpose—January 2.

To William Morley, lace manufacturer; for his having invented or found out, certain improvements in, and additions to, certain machines or machinery now in use for making lace, or net, commonly called bobbin or twist net lace—January 9.

To James Andrew Hunt Grubbe, clerk; for his having invented a transmitting heat wall, for the ripening of fruit—January 9.

To James Gilbertson, grocer; for his having invented an improvement, or improvements in the construction of furnaces, by which they consume their own smoke—January 15.

To Charles Hooper, shear-grinder; for his having invented a new, valuable, useful, and improved machine for shearing, and cropping woollen and other cloths—January 15.

To John Evans, the younger, paper maker; for his having invented certain improvements on steam engines—January 15.

To Joseph Blades, gentleman; in consequence of a communication made to him by a certain foreigner residing abroad, for his new invented improvements in the water-proof stiffening for hats—January 15.

To William Newton, civil-engineer, and mechanical draftsman; in consequence of a communication made to him by a foreigner residing abroad, for an improved surgical chair-bed, with various appendages, designed for useful purposes—January 15.

To George Daniel Harris, clothier; for his having invented or discovered, certain improvements in dressing and preparing woollen yarns, and in cleansing, dressing, and finishing woollen cloths, and other fabrics, and in the apparatus for performing the same—January 15.

To James Falconer Atlee, gentleman; for his invention of certain improvements on bands, or hoops, for securing made and other masts, bowsprits, and yards, and applicable to other purposes—January 15.

To William Erskine Cochrane, esq., for his new invented improvements in certain apparatus for cooling, and other purposes—January 15.

To Joshua Taylor Beale, engineer, and George Richardson Porter, merchant; for their new invented mode of communicating heat for various purposes—January 19.

To William Percival, veterinary surgeon; for his new invented improvements in the construction and application of shoes without nails to the feet of horses, and certain other animals—January 19.

To George Jackson, attorney-at-law, for his invention of certain improvements in machinery for propelling boats and other vessels, which improvements are also applicable to water-wheels and other purposes—January 19.

The list of American Patents is unavoidably omitted, for want of room.

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NOTICES.

NEW ARRANGEMENT IN PUBLISHING AND DISTRIBUTING THE FRANKLIN JOURNAL.

THE publishing office of the Franklin Journal, will, hereafter, be at the Hall of the Institute. The Editorial department will remain unchanged, but the work has become the property of the Franklin Institute. Mr. William Hamilton has been appointed *Actuary*, and all communications relating to the subscription to, or the distribution of the Journal, should, hereafter, be addressed to him at his office. Communications for insertion, or relating to the objects of the work, should be sent direct to the Editor.

The distribution of a widely extended periodical, requires the undivided attention of an individual; and it is believed, that the new arrangement will insure a more prompt and efficient management in this particular, than has hitherto been found to be practicable, notwithstanding the care of the late agent. Although the principal publication office will be at the Institute, Mr. Dobson will continue to aid in the diffusion of the work, and will communicate to the Editor, or to the Actuary, whatever concerns its interests.

Care will be taken, on the commencement of the next volume, to have the numbers issue simultaneously, at Philadelphia, and at the seat of the General Government.

SUBSCRIBERS IN THE STATE OF NEW YORK.

SUBSCRIBERS who account with the agent in New York, are particularly requested to observe that Messrs. G. & C. CARVILL, of the city of New York, are now the only agents of the work there; *all payments*, whether for arrearages or otherwise, must be made to them alone

END OF VOL. V.

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania;

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

EDITED

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VOL. II.

NEW SERIES.

PHILADELPHIA:

PUBLISHED BY THE FRANKLIN INSTITUTE, AT THEIR HALL;

PISHEY THOMPSON, WASHINGTON CITY; G. & C. CARVILL, NEW YORK; AND MONROE & FRANCIS, BOSTON.

J. HARDING, PRINTER.

1828